Vol. 12, No. 8
April 30, 1987

Energy Research Abstracts

Abstracts 15266-17685

Office of Scientific & Technical Information
UNITED STATES DEPARTMENT OF ENERGY

CURRENT INFORMATION ON ENERGY

To provide immediate and complete coverage of literature related to major Department programs, the Office of Scientific and Technical Information provides an on-line retrieval system, data bases, and current-awareness publications. The Energy Data Base (EDB), which contains all unclassified, unlimited energy and nuclear related information processed by OSTI since 1974, and the Nuclear Science Abstracts Data Base (NSA), which covers nuclear information from 1948 through June 1976, are available for machine searching using commercial on-line retrieval systems. All information in the publications listed below, plus additional backup information, is included in the EDB. Current information being added to the EDB is available for on-line searching via the OSTI Automated Retrieval System (OARS) accessible to DOE and contractors through the Integrated Technical Information System (ITIS).

The publications described below and access to ITIS/OARS are available to Department of Energy and contractor components from the Office of Scientific and Technical Information, U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831/Telephone (615) 576-1301; FTS 626-1301.

PUBLICATIONS OF THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize legislative, regulatory, and other legal aspects, as well as social, economic, and environmental impacts. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price is $72.00 for domestic (North America) or $90.00 for foreign (outside North America) subscribers; a single issue is $5.00 or $6.25, respectively.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price for the 24 issues is $146.00 for domestic (North America) subscribers or $182.50 for foreign (outside North America) subscribers. A single issue is $14.00 or $17.50, respectively.

DOE Patents Available for Licensing (PAL)

DOE is prepared to grant exclusive or nonexclusive, revocable licenses under DOE-owned U. S. patents and patent applications; this semiannual publication provides abstracting and indexing coverage of this literature. *PAL* is available as PB87-946800 from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 on a standing order basis through an NTIS Deposit Account. To establish an NTIS account, send the minimum $25.00 deposit to NTIS, Attn: Customer Accounts. A single issue is $12.00 for domestic (North America) and $24.00 for foreign (outside North America).

Energy Meetings (EM)

A monthly listing of conferences, symposia, workshops, etc., pertaining to DOE's programmatic interests. *EM* is available on subscription (use PB87-901500) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $70.00 for domestic subscribers and $140.00 for subscribers outside the North American continent; a single issue is $8.00 and $16.00, respectively.

The following semimonthly bulletins are also available from the National Technical Information Service. The annual subscription rate for one volume (calendar) year (24 issues; no indexes) is $80.00 for domestic (North America) and $160.00 for foreign (outside North America) subscribers; use the identifying order number (PB- No.) when subscribing.

Acid Precipitation (APC)–**PB87-901000.** Acid precipitation, including effects and possible control measures.

Buildings Energy Technology (BET)–**PB87-900700.** Technology required for energy conservation in buildings of all types.

Coal-Based Synfuels (CBS)–**PB87-901400.** Conversion of coal into gaseous or liquid fuels.

Coal Combustion and Utilization (CCU)–**PB87-914400.** Coal combustion, including fluidized bed combustion, and direct utilization of coal for power generation, fuel cells, and MHD generators.

Coal Preparation and Pollution Control (CPC)–**PB87-900800.** Coal preparation and cleaning and reducing pollution from its direct combustion.

Direct Energy Conversion (DEC)–**PB87-946600.** Photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells.

Energy from Biomass (EFB)–**PB87-900600.** Biomass production, conversion, and utilization for energy.

Geothermal Energy Technology (GET)–**PB87-914700.** Exploration, development, and utilization of geothermal resources.

Heavy-Ion Reactions (HIR)–**PB87-900500.** Heavy-ion ($A > 4$) reactions.

Laser Research (LAR)–**PB87-901100.** Laser research and development, excluding applications.

Nuclear Fuel Cycle (NFC)–**PB87-913400.** Both front and back ends of the nuclear fuel cycle.

Nuclear Reactor Safety (NRS)–**PB87-913500.** Accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures.

Radioactive Waste Management (RWM)–**PB87-902900.** Management aspects of transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers.

Solar Thermal Energy Technology (STT)–**PB87-901200.** Research and development of efficient and reliable solar thermal conversion systems.

Transportation Energy Research (TER)–**PB87-900900.** Energy-efficient advanced automotive propulsion systems and transportation energy conservation.

Unconventional Petroleum (UCP)–**PB87-901300.** Secondary and tertiary recovery of petroleum and oil shales and tar sands.

INTERNATIONAL ENERGY PUBLICATIONS

The Office of Scientific and Technical Information (OSTI) cooperates in the publication of international abstract journals with the following: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts;* and (3) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts.* In each case, the cognizant foreign agency provides the non-U. S. information to OSTI for inclusion in the Energy Data Base; in turn, OSTI provides the U. S. information for input into the respective journal.

Atomindex

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from Bernan Associates—UNIPUB, 10033-F King Highway, Lanham, MD 20706. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $355.

Biomass Abstracts

A bimonthly abstract journal with comprehensive coverage of information on the conversion of biomass to energy. *Biomass Abstracts* is available free to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 60 IR pounds per year for participating countries and 90 IR pounds per year for nonparticipating countries. Make checks payable to the Institute.

Coal Abstracts

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W CEX, England, for 110 pounds sterling per year.

International Copyright, © U. S. Department of Energy, 1987, under the provisions of the Universal Copyright Convention, United States copyright is not asserted under the United States Copyright Law, Title 17, United States Code.

energinfo ERA™

Vol. 12, No. 8
ISSN: 0160-3604
CODEN: ERABD
April 30, 1987

ENERGY RESEARCH ABSTRACTS

ABOUT THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, OSTI places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Although the literature of science is emphasized, coverage extends to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish the mission of furnishing centralized support for Departmental elements in managing their scientific and technical information, OSTI builds and maintains computerized data bases and disseminates information via computerized retrieval systems and announcement publications such as abstract journals, bibliographies, and bulletins. Direct access to OSTI's Energy Data Base (EDB) and Nuclear Science Abstracts Data Base (NSA) is available to the U. S. scientific community through commercial on-line retrieval systems. Access to these data bases from outside the United States is available only through formal exchange agreements. The current-year EDB records, DOE Research-In-Progress, and various other specialized DOE data bases are available to DOE offices and contractors and other government agencies through the OSTI Automated Retrieval System (OARS), which is a major component of the Integrated Technical Information System (ITIS). In addition to providing access to the OSTI on-line systems, ITIS serves as a gateway to other government and commercial systems and provides information merging for customized information products. The Office of Scientific and Technical Information has developed systems to record and communicate energy-related research-in-progress information, to track research report deliverables from DOE contractors, to test and make available DOE-funded computer software programs with scientific and management applications, and to produce special publications in support of DOE program offices. To manage DOE's technical information resources effectively, OSTI's program is one of continual development and evaluation of new information products, systems, and technologies.

UNITED STATES DEPARTMENT OF ENERGY

John S. Herrington
Secretary

Harry L. Peebles
Director of Administration

Joseph G. Coyne
Manager
Office of Scientific and Technical Information

ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

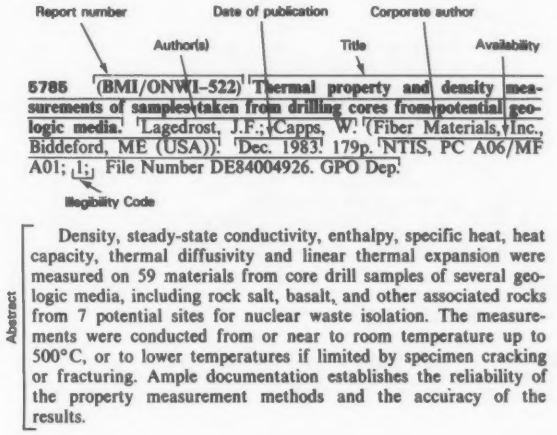
ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $146.00 for domestic subscribers and $182.50 for foreign subscribers. A single issue costs $14.00 (domestic) or $17.50 (foreign). The cumulative indexes will be available in printed form from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, and in microfiche form from the National Technical Information Service, U. S. Department of Commerce, Springfield, VA 22161.

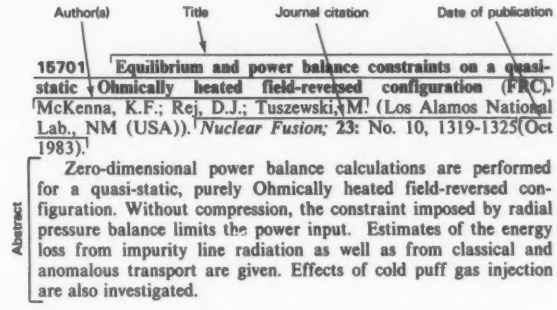
Office of Scientific and Technical Information
United States Department of Energy, P. O. Box 62, Oak Ridge, TN 37831

HOW TO USE *ENERGY RESEARCH ABSTRACTS*

ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Corporate author
Author(s)
Title
Availability
5785 (BMI/ONWI-522) Thermal property and density measurements of samples taken from drilling cores from potential geologic media. Lagedrost, J.F.; Capps, W. (Fiber Materials, Inc., Biddeford, ME (USA)). Dec. 1983. 179p. NTIS, PC A06/MF A01; 1; File Number DE84004926. GPO Dep.
Legibility Code
Abstract
Density, steady-state conductivity, enthalpy, specific heat, heat capacity, thermal diffusivity and linear thermal expansion were measured on 59 materials from core drill samples of several geologic media, including rock salt, basalt, and other associated rocks from 7 potential sites for nuclear waste isolation. The measurements were conducted from or near to room temperature up to 500°C, or to lower temperatures if limited by specimen cracking or fracturing. Ample documentation establishes the reliability of the property measurement methods and the accuracy of the results.


Author(s)
Title
Journal citation
Date of publication
15701 Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC). McKenna, K.F.; Rej, D.J.; Tuszewski, M. (Los Alamos National Lab., NM (USA)). Nuclear Fusion; 23: No. 10, 1319-1325 (Oct 1983).
Abstract
Zero-dimensional power balance calculations are performed for a quasi-static, purely Ohmically heated field-reversed configuration. Without compression, the constraint imposed by radial pressure balance limits the power input. Estimates of the energy loss from impurity line radiation as well as from classical and anomalous transport are given. Effects of cold puff gas injection are also investigated.

INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

5785 (BMI/ONWI-522) **Thermal property and density measurements of samples taken from drilling cores from potential geologic media.** Lagedrost, J.F.; Capps, W. **(Fiber Materials, Inc., Biddeford, ME (USA)).** Dec. 1983. 179p. NTIS File Number DE84004926. GPO Dep.

is indexed as:

Fiber Materials, Inc., Biddeford, ME (USA)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Capps, W., *See* Lagedrost, J. F.
Lagedrost, J.F., Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
McKenna, K.F., Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;US)
Rej, D.J., *See* McKenna, K.F.
Tuszewski, M., *See* McKenna, K.F.

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

SALT DEPOSITS
Density
Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
REVERSED-FIELD PINCH
Energy Balance
Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;AT)

• Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

AC06-76RL01830	**Fiber Materials, Inc., Biddeford, ME (USA)**	
	9:5785	BMI/ONWI-522

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under a File Number, that number is included in the availability statement. A file number–report number correlation is included for convenience.

BMI/ONWI-522	9:5785	NTIS, PC A09/MF A01. File Number DE84004926, Distribution Category MN-70

STAFF OF ENERGY RESEARCH ABSTRACTS

Henry D. Raleigh, Editor
M. Catherine Grissom, Assistant Editor

Chemistry, Materials, and Biological Sciences Branch
Chief, Vacant

Scientific Analysts
Polly S. Blackburn, *Environmental Sciences*
D. Lamar Cason, *Materials, Physical Chemistry, and Electric Power*
Pamela L. Gorman, *Chemical Engineering*
Lynda H. McLaren, *Nuclear Fuels and Radio- and Radiation Chemistry*
Lorne T. Newman, *Coal*
Axel C. Ringe, *Geosciences and Life Sciences*
Amy T. Tamura, *Fossil Fuels*
Dennis T. Traylor, *Biological Sciences and Biomass*

Nuclear Engineering and Physics Research Branch
Chief, Lila Smith

Scientific Analysts
James D. Bales, *Nuclear Engineering*
David C. Cunningham, *Nuclear Engineering*
Wanda R. Ferrell, *Atomic, Molecular, and Fluid Physics*
Douglas Lane, *Nuclear Physics*
Barry C. Steele, *Solar Energy*
Milton O. Whitson, *Fusion Energy*
Larry E. Williams, *High Energy Physics and Engineering*

Lawrence T. Whitehead, *Defense Programs*

Subject Heading Specialist
Mona H. Raridon

Contract Number and Report Number Specialist
Ramona N. Nelson

Computer Processing Coordinator
Billy H. Brady

Corporate Author Specialist
Patsy L. Hendricks

International Exchange Coordinator
Charles E. Stuber

Publishing Coordinator
Janice M. Blanton

Much of the information is provided by (1) bilateral exchange agreements with foreign organizations, and (2) exchange agreements or contracts with other U. S. government agencies, private firms, or institutions.

Foreign Sources

CEA Centre d'Etudes de Saclay
GIF-sur Yvette Cedex, France

Fachinformationszentrum
Energie, Physik, Mathematik GmbH
Karlsruhe, Federal Republic of Germany

IEA Biomass Conversion Service
Dublin, Ireland

IEA Coal Research
Technical Information Service
London, England

International Atomic Energy Agency
International Nuclear Information System
Vienna, Austria

Nordic Energy Libraries
Risoe National Library
Roskilde, Denmark

Research Center
Netherlands Energy Research Foundation
Petten, Holland

United Kingdom of Great Britain and Northern Ireland
Department of Energy
London, England

U. S. Sources

American Institute of Physics
New York, NY

Department of Commerce
National Technical Information Service
Springfield, VA

Information Management Services, Inc.
Oak Ridge, TN

National Aeronautics and Space Administration
Scientific and Technical Information Division
Springfield, VA

National Institutes of Health
National Library of Medicine
Bethesda, MD

NOVA Information Services Company
Commack, NY

Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts,* Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 41 first-level and 276 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

01 COAL AND COAL PRODUCTS
- 03 Preparation
- 04 Processing
- 05 By-Products
- 06 Properties
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves and Exploration
- 20 Mining
- 30 Transport and Handling
- 40 Combustion
- 50 Marketing and Economics
- 60 Health and Safety
- 70 Legislation and Regulations

02 PETROLEUM
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Marketing and Economics
- 08 Waste Management
- 09 Environmental Aspects
- 10 Legislation and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Storage
- 50 Combustion

03 NATURAL GAS
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Marketing and Economics
- 07 Waste Management
- 08 Environmental Aspects
- 09 Artificial Stimulation
- 10 Legislation and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Combustion
- 50 Storage

04 OIL SHALES AND TAR SANDS
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Direct Uses and By-Products
- 07 Health and Safety
- 08 Marketing and Economics
- 09 Waste Research and Management
- 10 Environmental Aspects
- 20 Regulations

05 NUCLEAR FUELS
- 01 Reserves, Exploration, and Mining
- 04 Feed Processing
- 05 Uranium Enrichment
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 10 Marketing, Economics, and By-Products
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Safeguards, Inspection, and Accountability

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies

08 HYDROGEN
- 01 Production
- 02 Storage
- 03 Transport
- 04 Marketing and Economics
- 05 Safety
- 06 Industrial and Commercial Use
- 07 By-Products
- 08 Properties
- 09 Environmental Aspects

09 OTHER SYNTHETIC AND NATURAL FUELS
- 01 Hydrocarbon Fuels
- 02 Alcohol Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 04 Solid Waste and Wood Fuels
- 05 Liquid Waste Fuels
- 06 Gaseous Waste Fuels

13 HYDRO ENERGY
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Regulations and Licensing
- 05 Economics and Management
- 06 Environmental Aspects
- 07 Power-Conversion Systems

14 SOLAR ENERGY
- 01 Resources and Availability
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Systems
- 07 Solar Thermal Power Systems
- 08 Ocean Energy Systems
- 09 Solar Thermal Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage

15 GEOTHERMAL ENERGY
- 01 Resource Status and Assessment
- 02 Geology and Hydrology of Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legal and Institutional Aspects
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 07 By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory

16 TIDAL AND WAVE POWER
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects

16 TIDAL AND WAVE POWER (CONT.)
07 Tidal Power Plants
08 Wave Energy Converters

17 WIND ENERGY
01 Availability (Climatology)
03 Regulations
04 Economics
05 Environmental Aspects
06 Wind Energy Engineering

20 ELECTRIC POWER ENGINEERING
01 Power Plants and Power Generation
02 Environmental Control Technology
03 Power Transmission and Distribution

21 NUCLEAR POWER PLANTS
01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
03 Power Reactors, Non-Breeding, Graphite Moderated
04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
05 Power Reactors, Breeding
06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
07 Regulation and Licensing
08 Economics

22 NUCLEAR REACTOR TECHNOLOGY
01 Theory and Calculation
02 Components and Accessories
03 Fuel Elements
04 Control Systems
05 Environmental Aspects
06 Research, Test, and Experimental Reactors
07 Plutonium and Isotope Production Reactors
08 Propulsion Reactors
09 Reactor Safety

25 ENERGY STORAGE
01 Magnetic
02 Compressed Gas
03 Pumped Hydro
04 Capacitor Banks
05 Flywheels
06 Thermal
07 Liquefied Gas
08 Chemical
09 Batteries

29 ENERGY PLANNING AND POLICY
01 Energy Analysis and Modeling
02 Economics and Sociology
03 Environment, Health, and Safety
04 Natural Resources
05 Research, Development, Demonstration, and Commercialization
06 Nuclear Energy
07 Transport and Storage
08 Waste Heat Utilization
10 Conservation
20 Supply, Demand, and Forecasting
30 Policy, Legislation, and Regulation
40 Fossil Fuels
50 Hydrogen and Synthetic Fuels
60 Electric Power
80 Consumption and Utilization
90 Unconventional Sources and Power Generation

30 DIRECT ENERGY CONVERSION
01 MHD Generators
02 EHD Generators
03 Thermoelectric Generators
04 Thermionic Converters
05 Fuel Cells
08 Miscellaneous Converters

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
01 Buildings
02 Transportation
03 Industry and Agriculture
06 Municipalities and Community Systems
09 Education and Public Relations

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
01 Internal Combustion Engines
02 External Combustion Engines
03 Electric-Powered Systems
04 Hybrid Systems
05 Flywheel Propulsion
06 Vehicle Design Factors
07 Emission Control
08 Alternative Fuels

36 MATERIALS
01 Metals and Alloys
02 Ceramics, Cermets, and Refractories
06 Other Materials

40 CHEMISTRY
01 Analytical and Separations Chemistry
02 Inorganic, Organic, and Physical Chemistry
04 Electrochemistry
05 Photochemistry
06 Radiation Chemistry
07 Radiochemistry and Nuclear Chemistry
08 Combustion, Pyrolysis, and High-Temperature Chemistry

42 ENGINEERING
02 Facilities and Equipment
03 Lasers
04 Heat Transfer and Fluid Flow
05 Materials Testing
08 Electronic Circuits and Devices
09 Waste Processing Plants and Equipment
10 Combustion Systems
20 Underground Engineering
30 Marine Engineering
40 Pollution Control Equipment
50 Power Cycles

43 PARTICLE ACCELERATORS
01 Design, Development, and Operation
02 Beam Dynamics, Field Calculations, and Ion Optics
03 Auxiliaries and Components
04 Storage Rings

44 INSTRUMENTATION
01 Radiation Instrumentation
02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
03 Miscellaneous Instruments
04 Well Logging Instrumentation

45 EXPLOSIONS AND EXPLOSIVES
01 Chemical
02 Nuclear
03 Explosion Detection

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
01 Basic Studies
02 Chemicals Monitoring and Transport
03 Radioactive Materials Monitoring and Transport
04 Thermal Effluents Monitoring and Transport
05 Site Resource and Use Studies
06 Regulations

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
01 Basic Studies
02 Chemicals Monitoring and Transport
03 Radioactive Materials Monitoring and Transport
04 Thermal Effluents Monitoring and Transport
05 Site Resource and Use Studies
06 Regulations

52 ENVIRONMENTAL SCIENCES, AQUATIC
01 Basic Studies
02 Chemicals Monitoring and Transport
03 Radioactive Materials Monitoring and Transport
04 Thermal Effluents Monitoring and Transport
05 Site Resource and Use Studies
06 Regulations

53 ENVIRONMENTAL—SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
01 Social and Economic Studies
02 Assessment of Energy Technologies

55 BIOMEDICAL SCIENCES, BASIC STUDIES
01 Behavioral Biology
02 Biochemistry
03 Cytology
04 Genetics
05 Metabolism
06 Medicine
07 Microbiology
08 Morphology
09 Pathology
10 Physiological Systems
20 Public Health
30 Agriculture and Food Technology

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
01 Radiation Effects
02 Thermal Effects
03 Chemicals Metabolism and Toxicology
04 Other Environmental Pollutant Effects

57 HEALTH AND SAFETY

58 GEOSCIENCES
01 Geology and Hydrology
02 Geophysics
03 Mineralogy, Petrology, and Rock Mechanics
04 Geochemistry
05 Oceanography

64 PHYSICS I
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS II
10 Nuclear Physics
20 Nuclear Properties and Reactions, A = 220 and Above, Experimental
30 Nuclear Theory
40 Radiation and Shielding Physics
50 Medical Physics
60 Condensed Matter Physics
61 Superconductivity
70 Theoretical and Mathematical Physics

70 FUSION ENERGY
01 Plasma Research
02 Fusion Power Plant Technology

99 GENERAL AND MISCELLANEOUS
01 Management
02 Mathematics and Computers
03 Information Handling
04 Law
05 Civilian Defense

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

FILE NUMBER CORRELATION

SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 41 first-level and 276 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 08 Alternative Fuels
- 03 Electric-Powered Systems
- 07 Emission Control
- 02 External Combustion Engines
- 05 Flywheel Propulsion
- 04 Hybrid Systems
- 01 Internal Combustion Engines
- 06 Vehicle Design Factors

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
- 03 Chemicals Metabolism and Toxicology
- 04 Other Environmental Pollutant Effects
- 01 Radiation Effects
- 02 Thermal Effects

55 BIOMEDICAL SCIENCES, BASIC STUDIES
- 30 Agriculture and Food Technology
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 06 Medicine
- 05 Metabolism
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 08 Combustion, Pyrolysis, and High-Temperature Chemistry
- 04 Electrochemistry
- 02 Inorganic, Organic, and Physical Chemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry

01 COAL AND COAL PRODUCTS
- 05 By-Products
- 40 Combustion
- 09 Environmental Aspects
- 60 Health and Safety
- 70 Legislation and Regulations
- 50 Marketing and Economics
- 20 Mining
- 03 Preparation
- 04 Processing
- 06 Properties
- 10 Reserves and Exploration
- 30 Transport and Handling
- 08 Waste Management

30 DIRECT ENERGY CONVERSION
- 02 EHD Generators
- 05 Fuel Cells
- 01 MHD Generators
- 08 Miscellaneous Converters
- 04 Thermionic Converters
- 03 Thermoelectric Generators

20 ELECTRIC POWER ENGINEERING
- 02 Environmental Control Technology
- 01 Power Plants and Power Generation
- 03 Power Transmission and Distribution

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 09 Education and Public Relations
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 02 Transportation

29 ENERGY PLANNING AND POLICY
- 10 Conservation
- 80 Consumption and Utilization
- 02 Economics and Sociology
- 60 Electric Power
- 01 Energy Analysis and Modeling
- 03 Environment, Health, and Safety
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 04 Natural Resources
- 06 Nuclear Energy
- 30 Policy, Legislation, and Regulation
- 05 Research, Development, Demonstration, and Commercialization
- 20 Supply, Demand, and Forecasting
- 07 Transport and Storage
- 90 Unconventional Sources and Power Generation
- 08 Waste Heat Utilization

25 ENERGY STORAGE
- 09 Batteries
- 04 Capacitor Banks
- 08 Chemical
- 02 Compressed Gas
- 05 Flywheels
- 07 Liquefied Gas
- 01 Magnetic
- 03 Pumped Hydro
- 06 Thermal

42 ENGINEERING
- 10 Combustion Systems
- 08 Electronic Circuits and Devices
- 02 Facilities and Equipment
- 04 Heat Transfer and Fluid Flow
- 03 Lasers
- 30 Marine Engineering
- 05 Materials Testing
- 40 Pollution Control Equipment
- 50 Power Cycles
- 20 Underground Engineering
- 09 Waste Processing Plants and Equipment

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies

52 ENVIRONMENTAL SCIENCES, AQUATIC (CONT.)
- 04 Thermal Effluents Monitoring and Transport

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

53 ENVIRONMENTAL—SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 02 Assessment of Energy Technologies
- 01 Social and Economic Studies

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 03 Explosion Detection
- 02 Nuclear

70 FUSION ENERGY
- 02 Fusion Power Plant Technology
- 01 Plasma Research

99 GENERAL AND MISCELLANEOUS
- 05 Civilian Defense
- 03 Information Handling
- 04 Law
- 01 Management
- 02 Mathematics and Computers

58 GEOSCIENCES
- 04 Geochemistry
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 05 Oceanography

15 GEOTHERMAL ENERGY
- 07 By-Products
- 10 Direct Energy Utilization
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 02 Geology and Hydrology of Geothermal Systems
- 20 Geothermal Data and Theory
- 09 Geothermal Engineering
- 03 Geothermal Exploration and Exploration Technology
- 08 Geothermal Power Plants
- 04 Legal and Institutional Aspects
- 01 Resource Status and Assessment

57 HEALTH AND SAFETY

13 HYDRO ENERGY
- 05 Economics and Management
- 06 Environmental Aspects
- 03 Plant Design and Operation
- 07 Power-Conversion Systems
- 04 Regulations and Licensing
- 01 Resources and Availability
- 02 Site Geology and Meteorology

08 HYDROGEN
- 07 By-Products
- 09 Environmental Aspects
- 06 Industrial and Commercial Use
- 04 Marketing and Economics
- 01 Production
- 08 Properties
- 05 Safety
- 02 Storage
- 03 Transport

44 INSTRUMENTATION
- 03 Miscellaneous Instruments
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 01 Radiation Instrumentation
- 04 Well Logging Instrumentation

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 03 Isotopic Power Supplies
- 01 Physical Isotope Separation
- 02 Radiation Sources

36 MATERIALS
- 02 Ceramics, Cermets, and Refractories
- 01 Metals and Alloys
- 06 Other Materials

03 NATURAL GAS
- 09 Artificial Stimulation
- 40 Combustion
- 03 Drilling, Production, and Processing
- 08 Environmental Aspects
- 02 Geology and Exploration
- 05 Health and Safety
- 10 Legislation and Regulation
- 06 Marketing and Economics
- 04 Products and By-Products
- 30 Properties
- 01 Reserves
- 50 Storage
- 20 Transport, Pipelines, and Handling
- 07 Waste Management

05 NUCLEAR FUELS
- 30 Environmental Aspects
- 04 Feed Processing
- 07 Fuels Production and Properties
- 40 Health and Safety
- 10 Marketing, Economics, and By-Products
- 01 Reserves, Exploration, and Mining
- 50 Safeguards, Inspection, and Accountability
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 05 Uranium Enrichment
- 20 Waste Management

21 NUCLEAR POWER PLANTS
- 08 Economics
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 05 Power Reactors, Breeding
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 07 Regulation and Licensing

22 NUCLEAR REACTOR TECHNOLOGY
- 02 Components and Accessories
- 04 Control Systems
- 05 Environmental Aspects
- 03 Fuel Elements
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety
- 06 Research, Test, and Experimental Reactors
- 01 Theory and Calculation

04 OIL SHALES AND TAR SANDS
- 06 Direct Uses and By-Products
- 03 Drilling, Fracturing, and Mining
- 10 Environmental Aspects
- 07 Health and Safety
- 08 Marketing and Economics
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 20 Regulations
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 09 Waste Research and Management

09 OTHER SYNTHETIC AND NATURAL FUELS
- 02 Alcohol Fuels
- 06 Gaseous Waste Fuels
- 01 Hydrocarbon Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 05 Liquid Waste Fuels
- 04 Solid Waste and Wood Fuels

43 PARTICLE ACCELERATORS
- 03 Auxiliaries and Components
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 01 Design, Development, and Operation
- 04 Storage Rings

02 PETROLEUM
- 50 Combustion
- 03 Drilling and Production
- 09 Environmental Aspects
- 02 Geology and Exploration
- 06 Health and Safety
- 10 Legislation and Regulation
- 07 Marketing and Economics
- 04 Processing
- 05 Products and By-Products

02 PETROLEUM (CONT.)
- 30 Properties
- 01 Reserves
- 40 Storage
- 20 Transport, Pipelines, and Handling
- 08 Waste Management

64 PHYSICS I
- 01 Astrophysics and Cosmology
- 02 Atmospheric Physics
- 03 Atomic, Molecular, and Chemical Physics
- 04 Fluid Physics
- 50 High Energy Physics

65 PHYSICS II
- 60 Condensed Matter Physics
- 50 Medical Physics
- 10 Nuclear Physics
- 20 Nuclear Properties and Reactions, A = 220 and Above, Experimental
- 30 Nuclear Theory
- 40 Radiation and Shielding Physics
- 61 Superconductivity
- 70 Theoretical and Mathematical Physics

14 SOLAR ENERGY
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 20 Heat Storage
- 08 Ocean Energy Systems
- 06 Photovoltaic Power Systems
- 01 Resources and Availability
- 10 Solar Collectors and Concentrators
- 05 Solar Energy Conversion
- 07 Solar Thermal Power Systems
- 09 Solar Thermal Utilization

16 TIDAL AND WAVE POWER
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 07 Tidal Power Plants
- 08 Wave Energy Converters

17 WIND ENERGY
- 01 Availability (Climatology)
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 06 Wind Energy Engineering

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

FILE NUMBER CORRELATION

ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

15266 **(DOE/FE—0079) Cooperative R and D ventures: An opportunity for leveraged research in fossil energy.** (USDOE Assistant Secretary for Fossil Energy, Washington, DC). Feb 1987. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005573.

In connection with its continuing exploration of a cooperative R & D venture program, the Department of Energy, Fossil Energy, has assembled herein some materials for use in connection with a series of regional meetings for public discussion of the concepts. The materials include a news release of January 14, 1987; a Federal Register Notice of January 26, 1987, announcing the regional meetings; and an excerpt from a previously published document (DOE/FE-0075) of October 1986 which describes the program. After determining that a proposed cooperative R & D venture addresses appropriate national needs, the focus of the government's review will be on the probable magnitude of the benefit streams to be derived from successful completion of the venture relative to its cost of participation. DOE/FE's assessment of the nature and value of probable returns will take into account the following interconnected elements: the quality and value of the venture research target; the soundness of the planned technical approach; the expertise of the technical team; the managerial strength, business acumen, and degree of corporate commitment of the primary venture partners; the business arrangements whereby achievements are to be translated into future returns for distribution to the original participants; and the probable state-of-the-art and the marketplace following completion of the R & D venture, relative to the subsequent steps and investments required to translate successful research results into successful commercial use. DOE/FE reiterates its commitment to flexibility, streamlining, and sound business and operating arrangements within the context of these proposed cooperative R & D ventures.

15267 **Proceedings: 1985 international conference on coal science.** Sydney, Australia; Pergamon Press (1985). 995p. (CONF-851003—). Pergamon Press, 19a Boundary St., Rushcutters Bay, N.S.W., 2011 Australia. File Number TI87004322. Contract FG01-84FE60425.

From Conference on coal science; Sydney, Australia (28 Oct 1985).

This volume covers the proceedings of the third of the current series of International Conferences on Coal Science, which was held 28-31 October 1985 in Sydney, N.S.W., Australia. Now that oil and gas prices have not only stabilized but have even shown some decline, complacency on future energy supplies from these sources could once more cast a shadow over coal and blunt the need for coal research. Such a course would be fraught with danger. The long-term situation remains substantially unchanged and, although the precise time remains uncertain, all the evidence points to a future when coal will have to serve as a substitute for declining resources in oil and gas; even now coal has a major role to play both as a fuel for combustion and for use in the metallurgical and other industries. Consequently the need for fundamental research into coal remains as strong as ever. To avoid a repetition of the events of the 70s and to ensure flexibility in energy supplies through to the next century, it is vital that this research effort be maintained. Papers have been entered individually into ERA and EDB.

0103 Preparation

REFER ALSO TO CITATION(S) 15274, 15283

15268 **(NP—7770062) Water removal characteristics of fine coal particles.** Fischer, D. (Technische Univ. Berlin (Germany, F.R.). Fachbereich Verfahrenstechnik). 11 Feb 1985. 107p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE87770062.

The water removal characteristics of black coal become the more difficult the smaller the average diameter of particles is. The dependence of the final water content on the share of particles <25 μm in the total material was substantiated: the greater the portion of m/sub <25/, the higher the final content of water. An overproportionate rise is noted in particular if m/sub <25/ is higher than about 16 percent. Very fine particles of coal <500 μm have a positive surface charge, while spoils have a negative one at a neutral pH value of the liquid phase. If the particle diameter d/sub max/ of a sample of coal particles is reduced from 500 μm to 25 μm, the surface charge of the very fine particles becomes negative. Surface charges were recorded indirectly during the investigations by determining electrophoretic mobility. Surface charge distributions can be modified to yield desired values by addition of reagents such as buffer solutions, respectively additives. Negative surface charge distributions, involving difficult water removal characteristics, can be shifted to distributions typical of low final water contents.

0104 Processing

REFER ALSO TO CITATION(S) 15267, 15301, 15303, 15307, 15334, 15583, 16193, 16403, 16421, 16599

15269 **(BNL—38267) Enhancement of coal quality by microbial demetalization and desulfurization.** Krishna, C.R.; Francis, A.J.; Dodge, C.J.; Sproull, R.D. (Brookhaven National Lab., Upton, NY (USA)). Jun 1986. Contract AC02-76CH00016. 4p. (CONF-8606258—1). NTIS MF A01; 2; GPO Dep. File Number DE87005246.

From Biological treatment of coal workshop; Washington, DC, USA (23 Jun 1986).

Microbial demetalization and desulfurization of Illinois No. 6, Pittsburgh No. 8, and Ohio Quarto No. 8 coals were studied. In addition to significant removal of sulfur (80%) and iron (45%); calcium, magnesium, sodium, and small amounts of aluminum and other trace metals were solubilized from all coal types tested. The process variables such as slurry concentration, particle size, degree of agitation, temperature, and CO_2 and nutrient concentrations affected demetalization and desulfurization to varying degrees. Microbial demetalization and desulfurization of coals not only reduced the ash quantity but increased the ash fusion temperature of various coal samples by altering the ash composition. An increase in ash fusion temperature is generally beneficial because of reduced slagging and fouling in coal-fired boilers. A preliminary economic analysis indicates that microbial cleaning of coal prior to combustion may be a more suitable process for the upgrading of low rank coals than other convectional methods.

15270 **(CONF-850522—3) Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants.** Anderson, G.L.; Berry, F.O.; Harmon, B.D.; Laurens, R.M.; Biljetina, R. (Institute of Gas Technology, Chicago, IL (USA)). 1985. Contract AC21-82MC19403. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003951.

From 5. annual contractors' review meeting on contaminant control in hot coal derived gas streams; Morgantown, WV, USA (7 May 1985).

During the past year, IGT has been conducting bench-scale studies on a conceptual high temperature fuel gas desulfurization process known as the mixed metal oxide process. The objective of this process is not only to remove the sulfur-containing compounds from hot (>1000°F) fuel gases to ppM levels, but also to directly recover this sulfur in its elemental form. The subject of these studies has been the use of a 90% by weight cobalt titanate/10% by weight zinc oxide mixture. Although the mixture performed reasonably well under eleven (11) cycles of testing, the results suggest that additional improvements in the sorbents are needed. To remove more than 99% of the fuel gas sulfur at 1300°F requires space velocities of less than 300 h^{-1} and space velocities of <100 h^{-1} are probably required to achieve good elemental sulfur production during regeneration of the mixture. Both of these findings indicate the need for improved sorbent reactivity. IGT has also recently completed preliminary process economic studies on both the mixed metal oxide process for high temperature fuel gas desulfurization and the use of a composite molten alkali carbonate/ceramic sorbent developed by IGT for high temperature HCl removal. The process economic studies on the mixed metal oxide process examined six (6) different configurations. These studies indicate a probable cost of between 6 and 20 mills/kWh depending upon the configuration. The least costly configuration was one in which oxygen rather than air was used to regenerate the sulfided sorbent mixture. However, IGT has not yet conducted any tests on this configuration to determine whether it is technically feasible. The process economic studies on the composite molten alkali carbonate/ceramic sorbent for high temperature HCl removal indicate a probable cost of about 5 mills/kWh when applied to a feed gas containing about 300 ppM HCl. 3 refs., 7 figs., 6 tabs.

15271 **(CONF-860948—5) Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers.** Carty, R.H.; Mason, D.M.; Babu, S.P. (Institute of Gas Technology, Chicago, IL (USA)). Sep 1986. Contract AC21-84MC21313. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003955.

From 3. annual Pittsburgh coal conference; Pittsburgh, PA, USA (8 Sep 1986).

The Institute of Gas Technology is conducting a research program on ash chemistry to predict the behavior of the mineral matter in a fluidized-bed gasifier and its downstream units based on a minimum analysis of the characteristics of the mineral matter present in the coal feed and on the operating conditions. The bench-scale fundamental research investigation on the behavior of mineral matter, contained in chars from Pittsburgh Seam Coal from the Consolidation Coal Company's Ireland Mine in Marshall County, West Virginia, and from the No. 11 seam of Kentucky coal, were conducted in a 2-inch ID gasifier with a perforated plate gas distributor at atmospheric pressure, at 1255 and 1366 K, with char carbon conversions ranging from 24% to 94%. Some of the tests were conducted with low oxygen, 0.31 to 0.32 mole percent in the feed gas and others with 5.0 to 5.7 mole percent oxygen to investigate the effect of temperature due to the reaction of oxygen with the char. Feed chars ad char residues obtained from the 2-inch-ID batch gasification tests were analyzed chemically and by Moessbauer spectroscopy and were examined by optical petrography. The data analysis indicate that, during gasification the pyrite decomposes to ferrous sulfide and, at times, a minor amount of metallic iron. The ferrous sulfide in the interior of the char particles remains stable until exposed by burn-off of the char. As gasification proceeds, some of the iron compounds react with clays and silica to form low-melting ferrous alumino-silicates. In the tests without the center jet, roughly 30% of the iron became silicate, mostly in poorly defined forms. In pilot plant runs, the ferrous aluminosilicate serves as the agglutinating agent, embedding other ash particles and forming nearly spherical and dense agglomerates that selectively drop out of the fluidized gasification zone. 3 refs, 6 figs., 4 tabs.

15272 **(CONF-860961—6) Protective coatings and claddings: Application/evaluation.** Baxter, D.J. (Argonne National Lab., IL (USA)). Aug 1986. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004659.

From Instrumentation, components and materials contractors' meeting; Morgantown, WV, USA (16 Sep 1986).

The objective of the project is to develop corrosion-resistant coatings for the protection of low-alloy steels exposed in downstream waste heat recovery systems of coal gasifiers. A specification will be formulated for boiler-grade steels and established coating procedures that will serve as a guide for future designers of heat recovery systems. Corrosion test results show that chemical composition is an important factor influencing the corrosion resistance of both Al- and Cr-containing coatings. Coatings containing 20 to 29% Al generally exhibited protective oxidation behavior under isothermal conditions in the mixed-gas environments, but at 14% Al, even with 0.4 to 2% Cr, breakaway corrosion occurred. Under thermal-cycling conditions, approximately 30% Al was inadequate in preventing sulfide scale formation, although the additional presence of 5% Cr reduced the amount of sulfide formed in the scale and also reduced the severity of internal corrosive degradation of the coating. The corrosion resistance of chromized steels is critically dependent upon the coating composition and physical defects. With about 17% Cr on the 2-1/4Cr-1Mo steel, breakaway corrosion was observed in the high-p/sub S/$_2$ gas mixture. However, with Cr contents in the range of 22 to 25%, protective oxidation behavior was sustained, even under thermal-cycling conditions, although thermal cycling caused an increase in internal corrosion. The intergranular nature of internal corrosion highlights the weakness of the sensitized grain boundaries. Chromium-rich intergranular carbides, formed upon cooling from the chromizing temperature of ~1100°C, resulted in the depletion of Cr from regions immediately adjacent to the carbide-containing grain boundaries. As a result, these regions had lower resistance to corrosion. Breakdown of protection of chromized carbon steel appeared to be caused by defects present in the coating. 7 refs., 1 fig., 2 tabs.

15273 **(CONF-860961—7) Advanced research in instrumentation and control technology: Capacitance flowmeter.** Bobis, J.P.; Raptis, A.C. (Argonne National Lab., IL (USA)). Aug 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004654.

From Instrumentation, components and materials contractors' meeting; Morgantown, WV, USA (16 Sep 1986).

The purpose of this task is to develop and apply instruments to measure the solid feedrate in coal gasification plant gas-solid feedlines, interstage lines, and recycling lines. To date, one of the most promising techniques for mass flow measurements in a solid/gas flow stream is the use of the nonintrusive capacitance sensor. The performance of the capacitance flowmeter (CF) with an improved electrode geometry has been measured experimentally in a gas-entrained 1000 μm glass bead flow stream at the Argonne National Laboratory (ANL) Solid/Gas Flow Test Facility (SGFTF). The CF measured the solid volume fraction (SVF) and particle velocity and the results were compared with time-of-flight measurements of short-lived radioactive particles. 21 refs., 9 figs.

15274 **(CONF-8608150—1) Recent developments in wet carbonization of peat.** Rue, D.M.; Mensinger, M.C.; Srivastava, V.J. (Institute of Gas Technology, Chicago, IL (USA)). Aug 1986. Contract AC22-83PC60775. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003952.

From Advances in peatlands engineering; Ottawa, Canada (25 Aug 1986).

Wet carbonization is a generic term for a thermal beneficiation process in which wet peat is heated to temperatures of 150 to 325°C at elevated pressures so that water present remains in liquid form. Wet carbonization produces a solid product with a higher heating value than raw peat. Wet-carbonized peat can be mechanically dewatered to a significantly lower moisture content than raw peat. A continuous-flow Process Research Unit (PRU), capable of processing 375 kg/h of peat slurry at temperatures and pressures up to 290°C and 7.60 MPa, respectively, was used to study the effect of wet-carbonization operating conditions on the peat. Thirteen tests were made with peats from Minnesota and Maine. For the Minnesota peat tests, the feed slurry solids concentration ranged from 6.1 to 13.7%. The average reactor operating temperatures and residence times ranged from 175 to 260°C and 1 to 60 minutes, respectively. The heating value enhancement of the wet-carbonized peats was as high as 21%, and the moisture content of mechanical-

ly-dewatered wet-carbonized peat was as low as 39% (compared with >65% for raw peat). A bench-scale, continuous two-phase anaerobic digestion system to recover energy and to treat wet-carbonization effluent water was designed, fabricated, and tested with effluent water from the PRU tests. At a short hydraulic retention time of 2.9 days, the system provided COD and BOD_5 removal efficiencies of 56 and 75%, respectively. The methane yield was approximately 86% of the average ultimate biodegradable yield. 6 refs., 10 figs., 2 tabs.

15275 (CONF-8611125—1) The U-GAS process for producing gas from coal. Patel, J.G.; Tarman, P.B.; Schora, F.C. (Institute of Gas Technology, Chicago, IL (USA); GDC, Inc., Chicago, IL (USA)). Nov 1986. 29p. Institute of Gas Technology, 3424 South State St., Chicago, IL 60616. File Number TI87900455.

From 4. advanced coal gasification symposium; Su Zhou, China (2 Nov 1986).

The Institute of Gas Technology (IGT) has developed the U-GAS process to produce a low- or medium-Btu gas (U-GAS) from different types of coal feed stocks. The process uses a combination of fluidized-bed gasification and ash agglomeration in a single-stage reactor. A 30 tons per day capacity pilot plant has been used to develop the process. Feedstocks ranging from unreactive coke to peat have been gasified successfully in the same pilot plant, indicating its ability to handle a wide variation in feedstock properties. An extensive data base for design and scale-up to a larger size gasifier has been developed in the pilot plant. Recent tests have investigated the possibilities of innovative sulfur and particulate cleanup from the raw product gas. These developments improve the economics of the process, especially for application of the gas as a fuel and for combined-cycle power generation. Activities related to commercialization of the U-GAS technology are proceeding in several countries. This is the second paper on the U-GAS process to be presented at the Advanced Coal Gasification Symposium Series of the People's Republic of China. In this paper, the results of recent pilot-plant tests are presented, and the supporting technical programs being conducted at IGT to broaden the technology base are described. 13 figs.

15276 (DOE/MC/20050—2226) Study of high temperature removal of alkali of a pressurized gasification system: Final report. Bachovchin, D.M.; Alvin, M.A.; DeZubay, E.A.; Mulik, P.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Chemical Sciences Div.). Oct 1986. Contract AC21-83MC20050. 225p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE87001035.

Advanced coal-fueled processes that use high-temperature (1500 F or more) gas cleaning have the potential for significant cost savings. Turbine corrosion control by alkali removal may be needed in such systems. A fixed bed of emathlite pellets had been identified earlier as a promising way to remove alkali metal vapors from hot gases. In the present program we examined the fundamental chemistry of the absorption reaction, demonstrated the removal concept in a bench-scale reactor, and developed the engineering basis for process scale-up. An industrial process for making emathlite pellets by slurry extrusion was defined. Pellet cost was estimated as $0.11 to $0.82 per ton of coal, depending on scale of production. The absorption mechanism was defined and shown to result in a sorbent capacity of 18 wt % sodium. A kinetic model that allows sizing of sorbent beds was developed. It was shown that absorption is effective even at very low gas-phase concentrations. The suggested process was demonstrated in a series of fixed bed tests, using up to 12 kg sorbent, at a hot gas cleanup test facility. Alkali removal of greater than 99% was demonstrated. Kinetics and capacity data indicate that even more removal could have been achieved with deeper beds. It was concluded that reduction of gas-phase sodium to the turbine tolerance of about 20 ppb is feasible with this technique. Example calculations of typical process sorbent consumption rates and reactor size requirements are presented. 7 refs., 46 figs., 39 tabs.

15277 (DOE/MC/20230—T5) CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984. Auyang, L.; Liu, Y.C. (Helipump, Inc., Brecksville, OH (USA)). [1987]. Contract AC21-83MC20230. 45p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86011514.

Development work on the CNG acid gas removal process under contract No. AC21-83MC20230 continued during the fifth quarter October 1, 1984 through December 31, 1984. Two tasks were active during the quarter: Task 1, triple-point crystallizer (crystallizer modifications and operation); and Task 2, hydrogen sulfide absorber operation. Within Task 1, two control schemes for crystal backwash were tested, and other crystallizer modifications were completed. Flow ratio control was tested satisfactorily and the results are consistent with calculated predictions. Concentration feedback control has also been tested, but the response of this scheme is slow because of the time lag in concentration analysis. Crystallizer modifications include (1) a new flasher filter with finer grid; (2) vertical flasher agitator impellers; (3) a new flasher feed gas/liquid separator; (4) a larger flasher top section; and (5) a compressor cooling fan. Within Task 2, shake-down runs of the hydrogen sulfide absorber have been made. A start-up and operating procedure for the absorber was developed based on experience gained from the shake-down runs. In addition, the sampling and concentration analysis system and the flow measurement system of the process demonstration unit are discussed in this report. 1 ref., 9 figs., 9 tabs.

15278 (DOE/MC/21004—T3) Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985. Solomon, P.R.; Serio, M.A.; Hamblen, D.G.; Heninger, S.G. (Advanced Fuel Research, Inc., East Hartford, CT (USA)). 1985. Contract AC21-84MC21004. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007605.

Eighteen of the runs outlined in the test plan for the high pressure reactor (HPR) using Montana Rosebud coal were done during the fourth quarter, bringing the total number completed to 40. These were all pyrolysis runs and included excursions in temperature, pressure, heating rate, residence time, and particle size. Additional work during the fourth quarter included devising plans for the gas mixing station so that pyrolysis or gasification runs can be done with helium, oxygen, or CO_2 mixed with nitrogen or argon. During the fourth quarter, pyrolysis studies were done at 30 K/min (0.5 K/s) in a combined thermogravimetric analyzer/evolved gas analyzer (TGA/EGA) with Montana Rosebud 200 x 270 mesh coal. We have tried to simultaneously fit kinetic data on two coals (North Dakota lignite and Montana Rosebud) from the TGA/EGA (0.5 K/s) and the heated tube reactor in order to optimize the set of kinetic rates and the coal composition parameters in the Functional Group model. The North Dakota lignite experiments in the heated tube reactor (HTR) and TGA/EGA and the optimization studies were done under our other METC contract. In general, the agreement of the model and the data from the two reactors was good for both coals. We have continued to do measurements of active site area, determined by oxygen chemisorption, surface area, determined by CO_2 absorption, and char reactivity, determined by the time for 50% burnoff in air on chars generated in this program. A comparison was made between our data and predictions by the regression model developed at METC for pyrolysis data from the AGC. In general, there was not good agreement when the METC model was extrapolated outside the range of conditions used in the AGC. 2 refs., 3 figs.

15279 (DOE/MC/21004—T4) Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985. Solomon, P.R.; Serio, M.A.; Hamblen, D.G.; Heninger, S.G. (Advanced Fuel Research, Inc., East Hartford, CT (USA)). 1985. Contract AC21-84MC21004. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010427.

During the fifth quarter, the gas mixing station for the high pressure reactor (HPR) system was completed. This station allows us to make reproducible binary mixtures of any two gases. It will be used for pyrolysis experiments in helium/nitrogen or oxygen/ni-

trogen and gasification experiments in helium/nitrogen or oxygen/nitrogen and gasification experiments in carbon dioxide/nitrogen. In addition, work began on modifications of the HPR system for high pressure (600 psig) operation. A limited amount of data was taken with the HPR system due to the modifications for the mixing station. However, the test plan experiments for pyrolysis in mixtures of helium and nitrogen were completed. In general, there is a slightly higher yield of volatiles and lower yield of char as the helium content (heating rate) increases. A new technique for measuring char reactivity resulted from an Army SBIR program and was further developed under our other METC Contract. It has also been used to characterize chars generated under the current program. It was evident that the severity of the thermal treatment had a direct effect on char reactivity. In this regard, rapid heating to a relatively low temperature was most favorable while slow heating to a high temperature was least favorable. With regard to pressure effects on reactivity, our preliminary data indicated that higher pressures produce chars lower initial reactivity. A total of four experiments were done in the heated tube reactor (HTR) at 60 psig, 800°C maximum tube temperature. The trends are the same as observed in the atmospheric pressure experiments for the same tube temperature and cold gas velocity. During the past quarter, a particle temperature (PT) model was under development for the high pressure entrained flow reactor (HPR). 5 refs., 5 figs.

15280 **(DOE/MC/21004—T5) Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986.** Solomon, P.R.; Serio, M.A.; Hamblen, D.G.; Heninger, S.G. (Advanced Fuel Research, Inc., East Hartford, CT (USA)). 1986. Contract AC21-84MC21004. 23p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86013230.

During the sixth quarter, work was completed on modifications of the high pressure reactor (HPR) system for higher pressure (600 psig) operation. A series of pyrolysis experiments was completed in the HPR using mixtures of nitrogen and oxygen at various pressures and compositions. The original intention of the O_2/N_2 experiments was to examine the effects of oxygen on the pyrolysis product distribution and the char reactivity. Unfortunately, at the temperature, residence time and pressure used for most of the experiments in this series (817°C, 0.47 s, 26 psig) nearly complete oxidation of the char and volatile products occurred. Additional CO_2 gasification experiments were done to provide a database for revising the test plan. These were done at a variety of temperatures, pressures and CO_2 concentrations. The reactor was then switched back to nitrogen and additional pyrolysis experiments were done at high pressure (300 psig). When it was observed that the material balance was falling off slightly, it was decided to repeat some of the previous pyrolysis experiments at low pressure. There appeared to be a small, but systematic, reduction in char recovery. We continued to do char reactivity and surface area measurements for chars using the new non-isothermal technique described in the Fifth Quarterly report. A comparison was made of the results for char, tar, and gas yields for 1 atm and 5 atm (60 psig) experiments in the HTR. The asymptotic yield of about 10% was similar for both sets of experiments. A comparison was also made of tar yields for the Montana Rosebud coal from experiments in the HPR and HTR. The observed tar yields were in good agreement for similar experimental conditions. A preliminary version of a particle temperature model for the HPR was completed during the past quarter. 9 refs., 2 figs., 3 tabs.

15281 **(DOE/MC/22059—2268) Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986.** Hedman, P.O.; Smoot, L.D. (Brigham Young Univ., Provo, UT (USA). Combustion Lab.). 31 Dec 1986. Contract AC21-85MC22059. 52p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87003927.

The three main tasks of this study are: (1) entrained coal gasification measurements, which include elevated pressure tests of three coal types, investigation of injector design, cold-flow measurements in simulated gasifier flows, and investigation of advanced optical diagnostic techniques that could be applied to gasification measurements; (2) improvement of the computer code for gasification processes, including improvement of physical submodels and numerical methods, and comparison of model predictions with experimental results for code validation; and (3) application of results to industrial and METC needs through technical seminars, expansion of a detailed data book, and distribution of the code to other users, including METC. Accomplishments for each of these tasks are presented. 36 refs., 11 figs., 5 tabs.

15282 **(DOE/PC/63032—T16) Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985.** (TRW Space and Technology Group, Redondo Beach, CA (USA)). May 1985. Contract AC22-83PC63032. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005394.

Emphasis this quarter has been on preparation and submittal of topical reports for the regeneration, coal-caustic reaction studies and filtration tasks of the project and on the selection of a continuous cocurrent reactor for the 20 lb/hour modular Gravimelt Process unit. In addition, permission was received from the Department of Energy to initiate the Task 9 regeneration section scale-up activity which will result in construction and testing of a 20 lb/hour regeneration system which will ultimately be incorporated as a part of the 20 lb/hour Gravimelt Process modular test unit.

15283 **(DOE/PC/72008—T8) Development of a microwave coal cleaning process: Technical progress report for March 1985-May 1985.** (TRW Space and Technology Group, Redondo Beach, CA (USA). Energy Div.). Jun 1985. Contract AC22-84PC72008. 48p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005382.

The objective of the program is to conduct bench scale studies to evaluate a process using microwave irradiation of caustic treated coal to remove sulfur and ash from coal. The program is organized into three tasks: equipment design and installation, shakedown testing, and process testing. This report covers the results from the design and installation activities during the report period and includes a description of the process and equipment as well as the status of equipment selection equipment procurement and installation, shakedown test plan preparation, and sampling and analysis procedure preparation and validation testing. 16 figs., 1 tab.

15284 **(DOE/PC/80016—T2) Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986.** McCarty, J.G.; Wilson, R.B.; Tong, G.T. (SRI International, Menlo Park, CA (USA)). 12 Nov 1986. Contract AC22-85PC80016. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005037.

We have made significant progress in developing novel catalysts for the Fischer-Tropsch synthesis (FTS). The stoichiometries of the cluster synthesis and surface-confining reactions on an alumina support for aluminum tetra- and aluminum hexa-ruthenium hydridocarbonyl cluster catalysts were determined by gas evolution measurements. Characterization with FTIR and NMR spectroscopy of the cluster intermediates is also consistent with the observed cluster catalyst stoichiometry, Al_2O_3-$Al(C_2H_5)$-$Ru_4H_3(CO)_{12}$ and Al_2O_3-$Al(C_2H_5)$-$Ru_6H(CO)_{18}$. Activation of the surface-confined supported cluster complex by heating to 573 K in inert gas or hydrogen is likely to produce a stabilized cluster catalyst due to affinity of aluminum for alumina and the strength of the aluminum-ruthenium bonds relative to ruthenium-ligand bonds. The cluster catalysts were tested for FTS in 2:1 H_2:CO syngas at 523 K and 1 atm. The 0.6 wt % Ru_4 catalyst had superior activity and about the same selectivity through C_5 hydrocarbons as a commercial alumina-supported 0.5 wt % Ru catalyst. The 1.2 wt % Ru_6 catalyst was less active but had similar selectivity. Substantial changes in selectivity of standard-fused iron catalysts were found following treatment to uniformly chemisorb submonolayer quantities of sulfur. Approximately 40% of a monolayer of sulfur was slowly adsorbed at 473 K on the potassium-promoted fused iron catalyst following reduction and passivation by accumulation of a surface layer of carbon and CO. The passivating layer was removed and the sulfur was locally dispersed by heating to 1000 K in hydrogen. The treated catalyst had a three-fold reduction in methane selectivity-relative to untreated reduced fused iron at 573 K, and the C_2 olefin yield approached 100%. 7 refs., 1 fig., 3 tabs.

15285 (DOE/PC/80023—T7) Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986. Klinzing, G.E. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). 1986. Contract AC22-85PC80023. 39p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004902.

The hydrogen probe consisting of the three units, flowmeter, laser, sensing device, nickel tubing probe and computer were shipped to Wilsonville in June. The operation of installation was impeded by the presence of dirt in the hydrogen delivery line to the probe. This caused a clogging of the multiport valve. The valve after cleaning still did not operate in the full cycle as anticipated. It was disassembled from the unit and tested in the university laboratory facility. After several tests, it was found that the valve is working properly with no problems and it is now ready to be placed again in the Wilsonville facility for the testing to resume. (AT)

15286 (DOE/PC/80526—T6) Chemical trapping of CO/H_2 surface species: Quarterly report. Blackmond, D.G.; Wender, I. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). Jan 1987. Contract FG22-85PC80526. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005181.

The work on the project during the last quarter has focused on the design and construction of a system that will allow us to better investigate how a model organometallic complex may serve as a system analogous to that of the metal catalyst-adsorbate bond. We have also made considerable modifications to the reaction system for performing in-situ trapping reactions concurrent with the catalytic CO + H_2 reaction. Positive preliminary results involving chemical trapping of RuY zeolites in situ during CO hydrogenation have led to further exploration of Ru on other supports. The action of the trapping reagent appears to be complex in nature, involving a number of processes in addition to the alkylation of surface-carbon or surface-oxygen bonds. The presence of I in CH_3I suppresses hydrogenation. Large amounts of the reagent effectively poisons the catalyst surface, but very small amounts (<0.1%) may actually enhance hydrogenation. Ru on other supports seems to deactivate much more quickly than RuY zeolite under trapping conditions. The new experimental system for trapping reactions promises to allow us to expand this work greatly to other catalyst systems. 2 figs.

15287 (DOE/PC/90529—1) Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986. Calo, J.M. (Brown Univ., Providence, RI (USA). Div. of Engineering). 1986. Contract FG22-86PC90529. 22p. NTIS MF A01; 2; GPO Dep. File Number DE87004915.

This project is concerned with the development of a new technique for measuring the rates of diffusion of gases on the microporous structure of coal chars. Mass transport in pores of molecular dimensions is known to be an activated, relatively slow process. The gasification of coal chars may be transport-limited. To correlate and predict gasification reactivity, it is quite important to know over what range of conditions such limitations may control. The initial transient behavior of a gaseous species exposed to such chars primarily reflects the transport resistance offered by the micropores. When this process is conducted using a well-defined perturbation in a mixed reactor, the diffusion step can often be separated from the subsequent reaction steps, so that measurements can be conducted under actual gasification conditions. We will apply this technique to a few well-characterized coal/carbon chars. Micropore diffusion times in these samples will be determined for various gaseous species relevant to the gasification environments. The primary variables will be temperature and degree of conversion (i.e., burn-off). Measurements will be examined with respect to changes occurring in the pore structure of the chars. In this first quarterly technical progress report, the background and objectives of the study and the requisite experimental preparations to begin the micropore diffusion studies are presented. In particular, during the reporting period: the graduate assistant on this project conducted a literature review of the general area of micropore diffusion and began to acquire the necessary background for the experimental study; the inception of a pore model was undertaken involving micropore diffusion; and the Autoclave Engineers 3" Berty catalytic reactor has been refurbished and modified for the study. 59 refs., 2 figs.

15288 (EPRI-AP—5029) Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report. Richter, G.N.; Barot, D.T.; Crotty, J.M. (Texaco, Inc., South El Monte, CA (USA). Montebello Research Lab.; Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 31p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920251.

The extended pilot plant evaluation was conducted at Texaco's Montebello Research Laboratory to determine the suitability of Illinois No. 6 and Pittsburgh No. 8 coals as feedstock for the Texaco coal gasification process. The gasifier was operated for 10.5 days on Illinois No. 6 coal and for 9.2 cumulative days on Pittsburgh No. 8 coal at wide range of operating conditions. The test results were evaluated to determine the operability of the process and the effects of changes in operating variables on the gasification performance. Based on the pilot unit test results, both the Illinois No. 6 and the Pittsburgh No. 8 coals were found to be acceptable feedstocks for the Texaco coal gasification process and operating guidelines for testing these coal at Cool Water were proposed. 2 figs., 5 tabs.

15289 (NP—7770049) Investigation of extraction of a model mixture similar to coal oil with supercritical gases. Prange, M. (Paderborn Univ. (Gesamthochschule) (Germany, F.R.). Abt. fuer Naturwissenschaften 2). 10 Jan 1986. 153p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87770049.

In order to make the identification and quantitative determination of individual components possible, a model mixture consisting of 18 components was substituted for a coal medium oil (boiling point 180/sup 0/C to 350/sup 0/C). Extraction experiments were carried out in varying conditions in a high pressure apparatus designed for this purpose. The pressure (5 to 30 MPa), the temperature (308 to 338 K) and the extraction gases used (CO/sub 2/, trifluormethane (Frigen 23)) were varied in these experiments. In order to examine the distribution coefficients and separation factors at various compositions of the mixture, the quantity ratios of the different groups of materials (alkanes, aromatics and phenols) in the mixture used were varied during extraction with Frigen 23 in constant extraction conditions (308 K, 10.8 MPa). Series of measurements were also taken, in which a solvent competing with the extraction gas was added, in order to increase the structure selectivity (CO/sub 2//benzyl alcohol/model mixture and Frigen 23/n-undecane/model mixture). In order to examine to what extent the measured data can be represented by a theoretical expression for such a phase equilibrium, fugacity coefficients or enhancement factors were calculated for the alkanes in the CO/sub 2//model mixture system using the Peng-Robinson state equation. These calculations agreed closely with the measured values. The results of this work show that the fractionation of a mixture, which contains components with different functional groups and different vapour pressures, is only possible to a certain extent. Also, because of the small separation factors, the enrichment which can be achieved in a single stage process is small, satisfactory separation results can only be achieved in a multi-stage separation process.

15290 (ORNL/Sub—81-69611/02) Evaluation of advanced materials for severe slurry erosion service: Final report. Wright, I.G.; Shetty, D.K.; Clauer, A.H.; Stropki, J.T. (Battelle Columbus Div., OH (USA); Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 300p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE87005161.

This report describes results from a study of the erosion behavior of selected WC-Co cermets, ceramic composites, and coatings in a well-controlled slurry test designed to simulate conditions pertinent to valves and pumps operating in coal-derived slurries. For a well-characterized series of WC-Co cermets (having a carbide grain size of approximately 1μm) it was found that the erosion

rate decreased systematically with increasing alloy hardness (and decreasing cobalt volume fraction). The various modes of material removal contributing to the overall erosion loss were identified from a study of the erosion damage resulting from incremental erosion exposures. These were used to formulate a semi-empirical model which describes the erosion rate of these alloys as a function of various structure-property relationships, and requires only the measurement of the erosion rate of pure cobalt under the conditions of interest. A series of ceramics exhibited erosion behaviors which could be categorized either as intergranular (brittle) or as transgranular/microflaking (ductile). Those ceramics which exhibited the transgranular mode of erosion in general eroded at a much slower rate than those which eroded by the intergranular mode. Ceramic-ceramic composites were shown to be capable of reasonable resistance to erosion; contrary to expectation, it was found that the matrix [in this case chemical-vapor deposited (CVD) silicon carbide] exhibited a higher erosion rate than the fiber phase. Coatings of CVD titanium diboride were found to be capable of providing excellent erosion resistance. However, the erosion behavior was very dependent on detailed coating conditions. 40 refs., 124 figs., 22 tabs.

15291 (PNL—5500-Pt.4, pp 1) **Characterization of metabolites and DNA adducts arising from direct coal liquids exposure.** Lucke, R.B.; Wilson, B.W.; Springer, D.L. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

An area of increasing interest in the past year has been the metabolites formed from coal liquid chemical fractions and from pure compounds representative of those found in coal liquids. Separation of metabolic products formed in vitro using rat liver S-9 and in vivo using mouse skin has been developed. The further reaction of these metabolites with DNA to form adducts has also been investigated with the ultimate goal of isolating and identifying the coal liquid metabolite/DNA adduct. Such data will help to identify directly those specific compounds metabolized by the organism in such a manner as to ultimately bind to cellular DNA and thereby, assumedly, to initiate eventual development of tumor growth.

15292 (PNL—5500-Pt.4, pp 2) **Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products.** Later, D.W. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Coal liquefaction products are primarily composed of polycyclic aromatic hydrocarbons (PAH) and their nitrogen, oxygen and sulfur derivative species. When subjected to catalytic hydrogenation conditions during liquefaction, PAH compounds lose aromaticity as hydrogen is incorporated into their molecular structure. Catalytic hydrogenation is currently being used as an integral process stage in contemporary, multiple-stage direct coal liquefaction facilities. Catalytic hydrogenation is used principally because it increases conversion efficiencies and H/C ratios and reduces levels of biological activity in laboratory assay systems. Analytical methods for the qualitative and quantitative determination of the hydroaromatic compounds, as well as understanding the impacts of catalytic hydrogenation on the biological activity of PAH, have therefore been of increase interest.

15293 (PNL—5500-Pt.4, pp 3) **Chemical characterization of materials from a close-coupled catalytic-catalytic two-stage coal liquefaction process.** Wilson, B.W.; Later, D.W. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Close-coupled two-stage liquefaction (CCTSL) is a coal conversion process in which both reactor stage contain a catalysts. No distillation or solids separation is carried out between stages, however, distillation and filtration are used to separate the final product material from the process stream leaving the second reactor. An objective of this process approach is to take maximum advantage of catalytically promoted reactions in converting coal. Materials from this process, including tetrahydrofuran (THF) extracts of first and second stage reactor products, were assayed for chemical composition and mutagenic activity. The data were then used to compare these materials to analogous streams from other single- and two-stage technologies. Mutational assays using the standard plate incorporation version of the histidine reversion assay with Salmonella typhimurium TA98 showed that the mutagenic activity of the crude extracts was relatively low.

15294 (PNL—5500-Pt.4, pp 7-8) **Supercritical fluid chromatography and mass spectrometry.** Smith, R.D.; Wright, B.W.; Udseth, H.R. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

At Pacific Northwest Laboratory (PNL) supercritical fluid methods are being developed for materials where conventional gas or liquid chromatographic methods and existing mass spectrometric methods are inadequate. The advantages of supercritical fluid chromatography (SFC) accrue from the nature of supercritical fluids. The solvating properties of supercritical fluids mobile phases approach those of liquid phases, yet solute diffusivity typically remains one to two orders of magnitude higher. These properties allow high separation efficiencies to be realized while exploiting the variable and often high solvating power of the supercritical fluid. Consequently, SFC has the capability of separating thermally labile and nonvolatile solutes and can do so with higher efficiencies than liquid chromatography. The introduction of the total chromatographic effluent into the mass spectrometer can be accomplished through the direct fluid injection (DFI) interface developed at PNL. The coupling of capillary SFC with mass spectrometry (SFC-MS) offers significant advantages over existing high performance liquid chromatography-MS combinations.

15295 (PNL-SA—14167) **Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis.** Wright, C.W.; Chess, E.K.; Stewart, D.L.; Mahlum, D.D.; Wilson, B.W. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1986. Contract AC06-76RL01830. 23p. (CONF-8610220—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002870.

From DOE contractors meeting; Pittsburgh, PA, USA (21 Oct 1986).

The purpose of this manuscript is to report the preliminary results of the chemical analysis and toxicological testing of feedstock and product samples from two different DOE-funded co-processing technologies, and to compare these results to those obtained from two-stage coal liquefaction materials. Co-processing samples were provided from (a) run 3 of the catalyzed, slurry, single-stage co-processing technology of UOP, Inc., during lined-out operations of plant 558 with a Lloydminster petroleum resid and Illinois No. 6 coal and (b) runs CTS-5 and -6 of the two-stage, close-coupled, Lummus Crest, Inc. (LCI), co-processing pilot plant during lined-out operations with an Arabian heavy petroleum resid and Pittsburgh seam coal. Selected feed and product stream samples were chemically characterized using the following techniques: chemical class fractionation by adsorption column chromatography, gas chromatography, gas chromatography/mass spectrometry, low-voltage probe-inlet mass spectrometry, field desorption (FD) mass spectrometry, and nuclear magnetic resonance (nmr) spectroscopy. The biological activities of selected crude co-processing samples and chemical class fractions were measured using the standard histidine reversion microbial mutagenicity assay and an initiation/promotion assay for tumorigenicity in mouse skin. In addition to feed and product stream comparison of the co-processing samples, the results of the analyses and testing of the co-processing product streams were compared to results from similar analyses of two-stage direct coal liquefaction (TSL) products. 15 refs., 10 figs., 6 tabs.

15296 **Analysis of a two-stream direct coal-gasification system.** Hanjalic, K.; Sijercic, M.; Crowe, C.T.; Wojcicki, S. (Univ. of Sarajevo, Sarajevo). pp 169 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

The wide variety of schemes proposed for the gasification of coal can be categorized according to the source of energy for gas-

ification. Gasification schemes in which the energy is supplied by a source removed from the gasification process are classified as external-source systems while other schemes in which the energy is derived from a source which is part of the gasification process are identified as internal-source systems.

15297 **Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K.** Carrazza, J.; Somorjai, G.A.; Heinemann, H. (Materials and Molecular Research Div., Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). *Preprints of Papers, American Chemical Society, Division of Fuel Chemistry;* 31: No. 3, 158-165(1986). (CONF-8609181—). Contract AC03-76SF00098.

From ACS symposium on syngas conversion catalysis advances in gasification; Santa Clara, CA, USA (7 Sep 1986).

The gasification of carbon with water vapor is an important reaction in the industrial production of H/sub 2/, CH/sub 4/, CO and CO/sub 2/. The use of catalysts is necessary if the process is carried out at temperatures below 1400 K. Two recent reviews discuss the properties of the various catalysts used for this purpose. Alkaline and alkaline-earth hydroxides and carbonates are the catalysts most commonly studied. These compounds only show catalytic activity at temperatures above 1000 K. Previous work shows that below this temperature KOH reacts stochiometrically with graphite and water vapor to produce H/sub 2/ and a stable surface compound. Transition metals, in particular nickel and iron, are able to catalyse this process at temperatures as low as 750 K, but they deactivate much faster than the alkaline and alkaline-earth salts. Several authors have reported that nickel and iron are only active as catalysts for this process if the reaction conditions favors their presence in the metallic state. The authors have recently reported that several mixtures of a transition metal oxide with potassium hydroxide are excellent catalysts for the gasification of graphite with steam. These catalysts are active at temperatures much lower than the alkaline and alkaline-earth salts and they deactivate more slowly than nickel and iron. In this previous publication it was shown that there is a synergistic effect between the transition metal and potassium. This communication summarizes recent results in the study of this type of catalyst. The authors have focused on the use of mixtures of potassium hydroxide and nickel oxide, since they showed the highest activity of all the systems previously studied.

15298 **Oxygen chemisorption as a tool for characterizing "young" chars.** Suuberg, E.M.; Calo, J.M.; Wojtowicz, M. (Div. of Engineering, Brown Univ., Providence, RI 02912). *Preprints of Papers, American Chemical Society, Division of Fuel Chemistry;* 31: No. 3, 186-193(1986). (CONF-8609181—).

From ACS symposium on syngas conversion catalysis advances in gasification; Santa Clara, CA, USA (7 Sep 1986).

The introduction of the concept of active surface area (ASA) as measured by oxygen adsorption had led in recent years to various attempts to correlate char reactivity towards oxygen-containing gasification agents (e.g., CO/sub 2/). As may be seen from the literature, this approach has met with some, although not universal, success. Theories have been advanced which suggest that only a portion of active sites may participate in actual gasification reactions. Hampering a fundamental understanding of what the role of active sites might be is lack of information on their nature. A wide variety of conditions has been suggested for measurement of ASA, generally involving temperatures in the range from 100°C to 350°C and oxygen pressures from fractions of a torr to atmospheric. Only in a few cases have these conditions been critically evaluated. In this paper, a series of experiments is reported upon, which seek to establish the importance of these conditions on determining the ASA of "young" chars (i.e., not heat treated for extended times).

0105 By-products

15299 (PNL—5500-Pt.4, pp 2-3) **Chemical analysis of coal-derived materials in commercial use.** Wright, C.W.; Later, D.W.; Wilson, B.W. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Extensive chemical class separations and chemical analyses were carried out on coal-tar-based topical agents (including shampoo, bath emulsion and pharmaceutical stock coal tar solutions in alcohol) used in symptomatic treatment of certain skin disorders. The chemical and toxicological properties of these materials were of interest because they have been used for several decades and yet there is no statistically significant indication of increased cancer risk in the exposed population. Results of these studies showed that, in general, there was little difference chemically or toxicologically between the coal tar fraction that was extracted from these preparations and from a National Bureau of Standards (NBS) standard coal tar. All samples tested showed initiation activity in the initiation/promotion assay. In microbial mutagenicity assays with Salmonella typhimurium TA98 each of the extracts or samples showed activity except for a bath emulsion prepared with irradiated coal tar. It was assumed that ionizing radiation may have destroyed the amino-polycyclic aromatic hydrocarbons (APHA) that are known to give rise to mutagenic activity in this assay.

0106 Properties

REFER ALSO TO CITATION(S) 15267, 15289, 15295, 15334, 15748

15300 **(CONF-860911—26) Mild oxidative solubilization of coal macerals.** Winans, R.E.; Hayatsu, R.; McBeth, R.L.; Scott, R.G.; Botto, R.E. (Argonne National Lab., IL (USA)). 07 Sep 1986. Contract W-31109-ENG-38. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004950.

From 192. American Chemical Society national meeting; Anaheim, CA, USA (7 Sep 1986).

The objective of this study is to solubilize coal macerals and an Argonne Premium Coal Sample using oxidation and to characterize these soluble products. A major problem in coal characterization and in coal utilization is the intractability of the coal macromolecular network. High temperature treatments yield smaller, volatile and soluble molecules, which can be greatly altered from their original structures, along with a significant amount of a non-volatile char. Mild oxidation should provide a soluble mixture of compounds in higher yields and with structural characteristics more like the original coal. The approach described in this paper attempts to oxidatively cleave only activated banzylic sites in the coal macromolecules in a two step process. In the first step benzylic sites which are partially active due to oxygen functionality either on the aromatic ring or on the benzyl carbon are further activated by the formation of pyridinium salts at that carbon from the reaction with pyridine and iodine. In the second step this carbon is oxidized by alkaline silver oxide resulting in formation of carboxylic acid groups. This report focuses on the yields of the oxidation step and the characterization of the products. In this study, both smaller and higher molecular weight fractions which were separated on the basis of solubility have been characterized in using gel permeation chromatography (GPC), GCMS, Pyrolysis MS (PyMS) the precise mass measurement mode, Fast Atom Bombardment (FAB) MS, and NMR. FAB MS has proven to be useful in the characterization of polar biological compounds. 6 refs., 6 figs., 1 tab.

15301 **(DOE/PC/60039—11) Phase behavior of coal fluids: Data for correlation development: Report for the period August 1, 1986 to October 31, 1986.** Robinson, R.L. Jr. (Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering). 1986. Contract FG22-83PC60039. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004912.

The effective design and operation of processes for conversion of coal to fluid fuels require accurate knowledge of the phase behavior of the fluid mixtures encountered in the conversion processes. Multiple phases are present in essentially all stages of feed preparation, conversion reactions and product separation; thus, knowledge of the behavior of these multiple phases is important in each step. The overall objective of the author's work is to develop accurate predictive methods for representation of vapor-liquid equilibria in systems encountered in coal-conversion processes. During the present report period, data were obtained on CO_2 + benzene at 40, 50 and 100°C to complement our previous measurements on

CO_2 in two-, three- and four-ring aromatic solvents. As with our previous data, the Soave and Peng-Robinson equations provide good representations of the solubilities when two interaction parameters (C_{12}, D_{12}) are employed. However, unlike the CO_2 + n-paraffin systems, interaction parameters for the CO_2 + aromatic systems have not been adequately correlated in terms of the solvent molecule properties. 10 refs., 3 figs., 2 tabs.

15302 **(DOE/PC/80505—T5) Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86.** (Maryland Univ., College Park (USA)). 1986. Contract FG22-85PC80505. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004588.

A method was investigated to measure the viscosity of a compressed liquid without a priori knowledge of the density by determining both the viscosity and the density from the damping and the period of an oscillating disk suspended in the fluid. The feasibility of the method was demonstrated experimentally for liquid toluene at temperatures from 25°C to 125°C and at pressures up to 30 MPa. Measurements of the viscosity of transdecalin and tetralin with capillary-flow viscometry were initiated. 6 refs.

15303 **(DOE/PC/80529—T4) Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986.** Wells, W.F.; Smoot, L.D. (Brigham Young Univ., Provo, UT (USA). Dept. of Chemical Engineering). 31 Jan 1987. Contract FG22-85PC80529. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005025.

The general objective of this study is to define and quantify the relationships between coal composition and the structure and associated combustion and conversion behavior for three very different domestic coals of interest. During this past quarter, nitrogen BET surface area was measured for the size-graded fractions of Wyoming subbituminous and North Dakota lignite coals. Preliminary tests of the temperature programmed reaction method were conducted. Design of a pyrolysis reactor is given. The tungsten ribbon lamp to be used for calibrating the optical pyrometer system was calibrated for temperature as a function of input voltage. The measured temperatures were corrected for the non-blackbody behavior of tungsten. Design of a coded-aperature to enable measurement of particles down to 20 microns is given. Plans are also presented for the following quarterly period. 15 refs., 4 figs., 1 tab.

15304 **(DOE/PC/80533—T5) Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986.** Starling, K.E.; Mallinson, R.G.; Li, M.H.; Peters, M.W.; Hulvey, R.D. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 1986. Contract FG22-85PC80533. 15p. NTIS MF A01; 2; GPO Dep. File Number DE87004911.

Calibrations for the determination of hydroxyl, primary amine, and secondary amine functional groups by infrared (IR) spectroscopy have been completed. The model compounds 1-naphthol, 1-aminonaphthalene, and carbazole were used for these calibrations. The IR analysis of the coal fluids is nearly complete. Elemental analysis of the samples is also proceeding and is nearing completion. Functional group contributions to ideal gas heat capacities and enthalpies were extended, based on model compounds, to low temperature regions. The functional group contributions were determined for temperatures ranging from 0 K to 1000 K. The results of the evaluation are tabulated for ideal gas heat capacity and enthalpy in Tables 2 and 3, respectively. The ideal gas heat capacity and enthalpy calculations were performed for pure compounds based on the following two cases: Case I. The ideal gas calorimetric properties were determined using functional group contributions by Benson's Method (Benson, 1968; Benson et al., 1969). Case II. The ideal gas calorimetric properties were determined using functional group contributions based on model compounds. A summary of the results is presented for ideal gas heat capacities and enthalpies. 3 refs., 5 figs., 5 tabs.

15305 **(NMRDI—2-74-4122) Diffusion of gases in New Mexico coals: Final technical report.** Williams, F.L.; Smith, D.M. (New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering; New Mexico Univ., Albuquerque (USA). New Mexico Research and Development Inst.). Feb 1987. 53p. New Mexico Research and Development Institute, Suite M, 457 Washington S.E., Albuquerque, NM 87108. File Number DE87900515.

As part of the first phase of this study, characterization of the pore volume and surface area of coal was principally undertaken while the more extensive and complex diffusivity and high-pressure adsorption experiments were being built. The careful characterization work resulted in new understanding of the limitations of mercury porosimetry and nitrogen adsorption analysis for coal. Our results indicate that as the size of coal particles in a sample decreases, a spurious, intruded-pore volume is indicated in mercury porosimetry. Furthermore, at higher pressures of Hg, the penetration of Hg may actually be a measure of micropore crushing rather than pore structure information. Nitrogen adsorption measurements do not reflect the total surface area of the coal which is easily accessed and measured by carbon dioxide. At the same time we found that condensation of nitrogen and NMR relaxation experiments may lead to significantly new interpretations of coal porosity. We find that measurements of condensation of nitrogen gives a direct measure of large pore volume that can be contrasted to total pore volumes. Preliminary NMR results show remarkable differences in apparent pore structure for similar New Mexico coals. The extension of basic science of coal structure and development of a potential new method for characterization of coal are major, long range impacts of this work. 41 refs., 9 figs., 6 tabs.

15306 **(NP—7900481) New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year.** Coleman, G.N. (Alabama Univ., University (USA). School of Mines and Energy Development). 1986. 40p. SOMED, Box 6282, Univ. of Alabama, Tuscaloosa, AL 35487. File Number TI87900481.

A slurry nebulization method for the determination of major, minor, and trace elements in coal has been developed. Coal samples are chopped to less than 100 mesh, then weighed into a micronizing mill. Using dilute nitric acid as a wetting agent, samples are micronized for 7 minutes. The resulting slurry is diluted and nebulized into a direct current plasma excitation source for analysis via emission spectrometry. Recoveries for most elements are better than 90%. Aluminum and chromium yielded variable results between 10% and 80%. Since particle size measurements indicate that aerosol transport should be efficient, variable recoveries are most likely due to inadequate sample/plasma contact time for the decomposition of refractory materials. 32 refs., 5 figs., 9 tabs.

15307 **(SECV-SO—86-102) Characterisation of insoluble residues from the hydrogenation of Victorian brown coals.** Mackay, G.H. (State Electricity Commission of Victoria, Melbourne (Australia)). 1986. 65p. NTIS.

Project no. 51-09.

During the hydrogenation of brown coal to liquid products some insoluble material, both carbonaceous and inorganic, always remains as a residue. Residues from a wide range of reaction conditions have been examined, principally by optical microscopy but also by scanning electron microscopy. The petrography of hydrogenation residues from brown coal is described in detail in this report. Also reported is the variation in the nature of residues with reaction conditions and the diagnosis of operational difficulties with hydrogenation plant from the petrographic examination of blockages. 22 references.

15308 **Investigation of coal hydrogenation using deuterium as an isotopic tracer.** Skowronski, R.P.; Heredy, L.A.; Rutlo, J.J. (Rockwell Intl., Canoga Fork, CA). pp 207-228 of Atomic and nuclear methods in fossil energy research. Filby, R.H. New York, NY; Plenum Press (1982).

Mechanisms of coal hydrogenation were investigated by using a deuterium tracer method. This method makes it possible to determine which structural positions in the coal react with hydro-

gen during liquefaction. A hydrogenation index (HI) and exchange index (EI) were formulated to measure the amount of deuterium incorporated due to hydrogenation and exchange reactions, respectively. In the coal-deuterium system, deuterium incorporation was found to vary both with product fraction and with structural position. In contrast, the deuterium contents of the fractions from donor solvent experiments were essentially uniform. The donor solvent experiments did, however, show preferential deuterium incorporation with respect to structural position. Important information with regard to the reaction mechanisms in the donor solvent system was obtained by analyzing the spent solvent mixture that was recovered from the reaction products. The results indicate that not only hydrogen donation but also hydrogen exchange involving the α-positions of tetralin can have a significant role in stabilizing the fragments that form during the thermal decomposition of the coal. In addition, evidence was obtained that there is also a direct route for deuterium incorporation into the coal products from the gas phase without the participation of tetralin.

0108 Waste Management

REFER ALSO TO CITATION(S) 15738, 15739, 15740, 15741, 15742, 15743, 15744, 15745, 15746, 15747, 15748, 15749, 15750, 15751, 15753, 16357, 16702, 16704

15309 **(CRIEPI—484014) Physical properties of cultivated soils mixed with coal ash as ameliorant.** Okabe, K. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan)). 1986. vp. (In Japanese). NTIS.

This study was carried out to promote the utilization of coal ash from coal-fired power plant as soil improving agent by mixing with agricultural soil. Fly ash and bottom ash were mixed with four soils (alluvial soil, volcanic ash soil, Masa soil, and sand) at the mixing rates of 0, 10, 30 and 50% respectively. Physical parameters such as soil texture, bulk density, three phase of soil, hydraulic conductivity, and water retention curve were measured. By fly ash application, there were consistent increases in fine sand and silt ratio, bulk density, solid ratio, and water-holding capacity, and a decrease in hydraulic conductivity (except alluvial soil). By bottom ash application, there were increases in coarse sand ratio, porosity, and hydraulic conductivity in all soils tested. Fly ash application was effective to improve physical properties of sandy soil. Bottom ash was effective to improve physical properties of alluvial and Masa soil.

15310 **(DOE/FE/60181—2271) Low-rank coal research: Quarterly technical progress report for the period April-June 1986.** (North Dakota Univ., Grand Forks (USA). Energy Research Center). Sep 1986. Contract FC21-83FE60181. 220p. (DOE/UNDERC/QTR—86/2). NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE87005885.

The UNDERC quarterly report involves testing use of cooling water made up of heated Great Plains gasification plant waste water, the preparation of coal slurries made of hot water dried low rank coal, boiler fouling by ash deposits, fluidized-bed combustion (including materials testing), slurries and particulates combustion, pyrolysis, devolatilization, etc.

15311 (EPRI-CS—4918-Vol.3, pp 5.1-5.18) **Advanced ESFF applied to a stoker coal-fired boiler.** Greiner, G.P.; Viner, A.; Hovis, L.S.; Gibbs, R. Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The ability of an electrostatically stimulated fabric filter (ESFF) to operate at a lower average pressure drop or a higher gas-to-cloth (G/C) ratio than a conventional fabric filter has been successfully demonstrated in the laboratory and in studies at two pilot plants with pulverized coal ashes. Those investigations involved the use of an electric field oriented parallel and in close proximity to the surface of the bag fabric. Recent laboratory investigations have shown that a center wire electrode, producing an electric field perpendicular (rather than parallel) to the surface of the fabric, produced as good or better results. This configuration has the potential advantages of operating on conductive dusts, with standard fabrics, and with less complicated electrode design when applied to reverse air or shaker baghouses. In order to evaluate the center wire configuration in the field, a pilot baghouse was installed on a slipstream of an industrial coal-fired stoker boiler. The pilot plant contains 8 in. diameter by 24 ft woven glass bags, employs reverse air cleaning, and can process 700 acfm of flue gas. Within the standard reverse air baghouse, individual bag flow monitors (IBFMs) are used to evaluate the fabric drag characteristics of each bag, allowing comparison of variables within the common module. Bags with and without electrical enhancement are compared. The pilot plant includes a data collection system that continuously monitors all key operating parameters, including individual bag flow, locally stores this data for several days, and transmits via telephone lines to both ETS and RTI offices for analysis. 1 reference, 8 figures, 1 table.

15312 (EPRI-CS—4918-Vol.3, pp 9.1-9.16) **Laboratory studies of the filtration performance of various filter media under simulated field conditions.** Frankenburg, P.E. (E.I. du Pont de Nemours & Co., Wilmington, DE). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Using laboratory equipment which simulates use conditions in the field, a number of filtration media for coal-fired boilers were studied. The filters were operated in the pulse-jet mode. Variables studies included: dust source, including various fly ashes and other dusts, air/cloth ratio, and cleaning frequency. Dust leakage, filtration efficiencies, and pressure drops were determined. The study led to the conclusion that the behavior of the various filter media investigated was predictable, but the ability to comply with emission requirements was greatly dependent on operating parameters. Limited correlation with full scale field results indicates the laboratory results to be valid and to have predictive value for field operations. 19 figures.

15313 (EPRI-CS—4918-Vol.3, pp 17.1-17.16) **Design of repairs to upgrade 10-year-old industrial precipitators.** Kunzweiler, V.L.; Landwehr, J.B. (Burns & McDonnell Engineering Co., Kansas City, MO). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

This paper discusses the design of precipitator repairs and upgrade for the two 1976 model industrial size precipitators on two 236,000 lb/hr, 450 psig pulverized coal boilers. Prior to their inspection and design of repairs, both units were seriously derated due to noncompliance with emission regulations. Problems encountered as well as specific parts failures are discussed. Some of the specific problems that are examined include the failure of rapper rods, rapper assemblies, wires and wire weights, insulators, and insulator housings. 6 figures.

15314 **(PB—87-113239/XAB) Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln.** (KVB, Inc., Irvine, CA (USA)). Oct 1986. 793p. NTIS, PC PC E99.

15315 **(PB—87-113247/XAB) Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985.** Benson, R.C.; Hunter, S.C. (KVB, Inc., Irvine, CA (USA)). Oct 1986. 395p. NTIS, PC A17/MF A01.

Also available in set of 3 reports PC E99, PB87-113239.

The report gives results of tests to evaluate combustion modifications for nitric oxide (NO) reduction and cement-product quality in a pilot-scale long-dry-process cement kiln firing pulverized coal. The kiln is rated at 11.35 kg/s (1080 tons/day) of cement with a thermal input rate of 70.3 MW (240 million Btu/hr). Of the combustion modifications evaluated in previous studies, vitiation of the primary air with inert gas (nitrogen) was considered the best alternative for NO reduction on a pilot-scale kiln. The percent reduction was established from a reference baseline of 1050 ppm (corrected to 3% O_2) and a kiln exit oxygen of 1.82%. The NO volu-

metric emissions were lowered to 880 ppm (corrected to 3% O_2) with a kiln exit oxygen of 0.7%. NOx reductions during the short-term nitrogen injection tests were about 25-30% with no adverse effects on product quality. Because of the interacting feed chemistry/kiln operations, it was not possible to clearly isolate the effect of nitrogen injection.

15316 (PB—87-113254/XAB) Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985. Benson, R.C.; Frohoff, R.A.; Parker, N.R. (KVB, Inc., Irvine, CA (USA)). Oct 1986. 134p. NTIS, PC A07/MF A01.

Also available in set of 3 reports PC E99, PB87-113239.

The report gives results of tests to evaluate combustion modifications for nitric oxide (NO) reduction and cement-product quality in a pilot-scale long-dry-process cement kiln firing pulverized coal. The kiln is rated at 11.35 kg/s (1080 tons/day) of cement with a thermal input rate of 70.3 MW (240 million Btu/hr). Of the combustion modifications evaluated in previous studies, vitiation of the primary air with inert gas (nitrogen) was considered the best alternative for NO reduction on a pilot-scale kiln. The percent reduction was established from a reference baseline of 1050 ppm (corrected to 3% O_2) and a kiln exit oxygen of 1.82%. The NO volumetric emissions were lowered to 880 ppm (corrected to 3% O_2) with a kiln exit oxygen of 0.7%. NOx reductions during the short-term nitrogen injection tests were about 25-30% with no adverse effects on product quality. Because of the interacting feed chemistry/kiln operations, it was not possible to clearly isolate the effect of nitrogen injection.

15317 (PB—87-113262/XAB) Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985. Benson, R.C.; Frohoff, R.A.; Parker, N.R. (KVB, Inc., Irvine, CA (USA)). Oct 1986. 264p. NTIS, PC A12/MF A01.

Also available in set of 3 reports PC E99, PB87-113239.

The report gives results of tests to evaluate combustion modifications for nitric oxide (NO) reduction and cement-product quality in a pilot-scale long-dry-process cement kiln firing pulverized coal. The kiln is rated at 11.35 kg/s (1080 tons/day) of cement with a thermal input rate of 70.3 MW (240 million Btu/hr). Of the combustion modifications evaluated in previous studies, vitiation of the primary air with inert gas (nitrogen) was considered the best alternative for NO reduction on a pilot-scale kiln. The percent reduction was established from a reference baseline of 1050 ppm (corrected to 3% O_2) and a kiln exit oxygen of 1.82%. The NO volumetric emissions were lowered to 880 ppm (corrected to 3% O_2) with a kiln exit oxygen of 0.7%. NOx reductions during the short-term nitrogen injection tests were about 25-30% with no adverse effects on product quality. Because of the interacting feed chemistry/kiln operations, it was not possible to clearly isolate the effect of nitrogen injection.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 15346, 16757, 16758

15318 (CRIEPI—285076) Plume washout and wet deposition of trace elements around the coal-fired power plant. Fujita, S. (Central Research Inst. of Electric Power Industry, Komae, Tokyo (Japan). Energy and Environment Lab.). 1986. vp. (In Japanese). NTIS.

Ground-based and airborne measurements of trace elements in precipitation and atmosphere were carried out around the coal-fired power plant of 1000 MW unit in the period of October 1983. The effect of plume washout and wet deposition of trace elements around the power plant was discussed on the basis of the data obtained. Concentration of trace elements with large diameter decreased with time when cyclone and front passed over the observational region. The scavenging coefficient of trace elements were ranged from 10^{-5} to $10^{-3}s^{-1}$ for rainfall rate of 3 to 4 mmh^{-1}. About half of the weight concentration of trace elements in plumes from coal-fired power plant are coarse particles and these materials may be scavenged out rapidly near the source in the case of rainy condition. The comparison between calculated value based on atmospheric diffusion model and ground-based observational value suggests that the contribution of plume washout is relatively small at the downwind distance of 10 km from the plant.

15319 (TNO-HMT-R—83/159A) On the mutagenicity of fly ash samples from the PGEM power plant 'Gelderland' at Nijmegen, as determined with the Ames test. Davis, P.B. (Hoofdgroep Maatschappelijke Technologie TNO, Apeldoorn (Netherlands)). 29 Jun 1985. 65p. (In Dutch). NTIS (US Sales Only), PC A04/MF A01. File Number DE87751294.

In March 1981 and January 1982, the stack ash and filter ash from the coal fired units at the PGEM power plant 'Gelderland' in Nijmegen were investigated in the Ames test, a test for the induction of mutations in special strains of the bacterium Salmonella typhimurium. Organic extracts of stack-ash were clearly mutagenic in the Ames test. The greatest effect (up to 180 revertants/mg stack-ash) was found in strain TA98, whilst no effect was found in strain TA1535. These results indicate that the effects produced can be ascribed, to a great extent, to 'frame-shift' mutations. The mutagenicity of the stack-ash extracts generally decreased in the presence of rat liver homogenate (system for metabolic activation). The mutagenicity disappeared if the stack-ash was heated to 400 C prior to preparation of the extract. This indicates that the mutagenicity is probably almost entirely due to the presence of organic compounds in the stack-ash. Experiments with nitroreductase-deficient strains inducted that a large part of the mutagenicity can be ascribed to nitro-compounds. Due to problems with the sampler used in January 1982, the mutagenicity of many of the stack-ash samples collected at that time could not be determined. Reaction between the hot stack gases and the bagfilter material used in the sampler resulted in contamination of the samples with toxic substances which masked the presence of mutagenic compounds, if present. Organic extracts of filter-ash were not mutagenic; extracts of ash from the final zone of the filter were generally not, or hardly, mutagenic.

0120 Mining

15320 (CSIRO-DG-GCM—63) Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland. McNabb, K.E.; Wardle, L.J. (Commonwealth Scientific and Industrial Research Organization, Mount Waverley (Australia). Div. of Geomechanics). 1986. 29p. NTIS.

This report presents an analysis of the stability of the main development roadways at German Creek Central Colliery, Queensland. Roadway stability is studied using a numerical model that realistically incorporates the characteristic geological features of the German Creek Main coal seam, i.e., in pervasive shear zone at seam mid-height and clay bands close to the top and bottom of the seam. Model predictions show that the properties of the clay bands can strongly influence the size of the yield zone in the roadway ribsides.

15321 (CSIRO-DG-GCM—64) System for automatic monitoring of longwall supports at Angus Place colliery. Dean, A.; Bride, J. (Commonwealth Scientific and Industrial Research Organization, Mount Waverley (Australia). Div. of Geomechanics). 1986. 15p. NTIS.

An intrinsically safe automatic data logging system was developed at the Division of Geomechanics and installed at the Angus Place colliery in the Western Coalfields of NSW, to monitor the hydraulic pressure in powered supports during longwall mining. The report describes the basic features of the system and its components, and indicates the logistical requirements for installation and operation, as exemplified at the Angus Place colliery.

15322 (PB—87-113171/XAB) Surface and underground coal-mine-equipment population, 1982. Information Circular/1986. Pojar, M.G. (Bureau of Mines, Twin Cities, MN (USA). Twin Cities Research Center). 1986. 32p. (BM-IC—9078). NTIS, PC A03/MF A01.

Library of Congress catalog card no. 86-600035.

The Bureau of Mines report estimates the population of the principal types of machinery in use by the coal-mining industry during 1982 in surface and underground mines. Estimates were arrived at using 1976 coal-equipment population estimates as baseline data with modifications made for new mine development, expansion, and closure occurring during 1976-82. Estimates were broken down into 3 regions that included all 26 coal-producing states. The mine models used to generate equipment information are included in the report, along with the hypothesized equipment use data. The equations and various factors used to determine the equipment adjustments for mine closings, new mine openings, and small-coal-mine operations are also identified.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 16474

15323 **(CONF-860961—5) Advanced research in instrumentation and control technology: Multiphase flow studies.** Doss, E.D.; Srinivasan, M.G.; Raptis, A.C. (Argonne National Lab., IL (USA)). Aug 1986. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004661.

From Instrumentation, components and materials contractors' meeting; Morgantown, WV, USA (16 Sep 1986).

The objective of these studies is to develop analytical models of the physical phenomena involved in the flow of solid/gas mixtures in ducts, and to verify the developed models through experiments in the Argonne National Laboratory's Solid/Gas Flow Test Facility (SGFTF). Analytical models thus verified would be used for developing nonintrusive flow instruments. Several analytical models have been developed that involve a one-dimensional model of pipe flow with suspensions. The models vary in their complexity and assumptions. 8 refs., 3 figs., 1 tab.

15324 **(DOE/PC/80524—T6) Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986.** Klinzing, G.E. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). 1986. Contract FG22-85PC80524. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005039.

The last two experiments scheduled for the erosion of ceramic straight pipes were completed during this quarter. The preliminary results accounting for the effect of gas velocity, solids flow rate and temperature on the erosion rates are presented and discussed. 5 figs., 3 tabs.

15325 **(PB—87-113197/XAB) Establishment of data bank on the self-heating of coal. Final report.** Riley, J.T.; Reasoner, J.W.; Holy, N.L.; Fatemi, S.M.; Yates, G.S. (Western Kentucky Univ., Bowling Green (USA)). Jul 1986. 119p. NTIS, PC A06/MF A01.

A data bank containing analytical data and barging information on 2283 barges of coal was established. A major portion of the barges contained coal transported from coal fields in Kentucky, Illinois, Indiana, and Ohio to river ports in the New Orleans area where it was loaded onto ships and exported. Extensive analytical data, coal temperature measurements, and meteorological data were collected for many of the barges. Separate barging experiments to examine the effect of various coal loading and compacting methods on self-heating as well as air flow patterns through the coal in barges were conducted. The effect of using carbon dioxide to exclude air from the bottom of barges as a means of reducing the degree of self-heating in coal was studied. Laboratory tests to measure the relative susceptibility of coals to undergo self-heating were studied.

0140 Combustion

REFER ALSO TO CITATION(S) 15267, 15303

15326 **(CONF-861251—2) Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air.** Berry, G.F.; Wang, C.S.; Chang, K.C.; Wolsky, A.M. (Argonne National Lab., IL (USA)). Dec 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004825.

From American Society of Mechanical Engineers winter annual meeting; New York, NY, USA (8 Dec 1986).

In this study, we used a one-dimensional coal combustion or gasification (1-DICOG) computer code to simulate differences in the combustion performance of pulverized coal when various CO_2/O_2 mixtures were substituted for air in the combustion process. Four test cases were analyzed, and results predicted by the model were compared with the corresponding results of actual combustion experiments. Comparisons of predicted and measured data for all test cases show the the observed trends of distributions of temperature and of species concentrations are predictable; discrepancies between predictions and measurements of these data are primarily attributed to limitations of the 1-DICOG computer code. We find that the combustion processes of pulverized coal can be completed in an atmosphere of CO_2 and O_2 over a range of CO_2-to-O_2 mole ratios between 2.23:1 and 3.65:1 - and that the combustion performance of coal burned in a CO_2/O_2 atmosphere with a 2.42:1 mole ratio closely resembles that of coal burned in air. 8 refs., 10 figs., 2 tabs.

15327 **(DOE/FE—0078) Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project.** (USDOE Assistant Secretary for Fossil Energy, Washington, DC). Feb 1987. 32p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005803.

One technology with high potential for meeting the end-of-century requirements for large power generation applications is combined-cycle pressurized fluidized bed combustion (PFBC). PFBC permits the combustion of a wide range of coals, including high sulfur coals, with a sorbent, such as limestone or dolomite, in a fluidized bed combustor at an elevated pressure. The sorbent captures most of the sulfur emissions during the combustion process itself which greatly reduces or completely eliminates the need for expensive downstream sulfur control equipment. PFBC produces a dry solid sorbent waste which is easily disposed of in an environmentally acceptable manner. In addition, the lower operating temperature substantially reduces nitrogen oxide emissions. In addition to these environmental features, PFBC components and plant facilities are considerably smaller than nonpressurized or conventional units of equal generating capacity. To further the development of PFBC, the Department of Energy and Ohio Power Company (OPCo), a wholly owned subsidiary of American Electric Power Company, Inc. (AEP), have negotiated a Cooperative Agreement to construct and operate a 70 megawatt (MWe) PFBC combined-cycle demonstration plant. The work to be performed under the Cooperative Agreement covers the design, construction, and operation of the demonstration plant. The overall objective of this project is to demonstrate PFBC technology at a large scale for use in commercial electric generating plants. The specific goal of this project is to demonstrate that combined-cycle PFBC technology is a cost-effective, reliable, and environmentally superior alternative to conventional coal fired electric power generation with flue gas desulfurization.

15328 **(DOE/PC/90751—T1) Transformations of inorganic coal constituents in combustion systems: Quarterly report No. 1 for the period October-December 1986.** Boni, A.A.; Srinivasachar, S.; Simons, G.A. (Physical Sciences, Inc., Andover, MA (USA)). 30 Jan 1987. Contract AC22-86PC90751. 35p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005018.

This project consists of an integrated series of experimental and modeling tasks performed by Physical Sciences Inc. (PSI) and five subcontractors to achieve the project objectives. Important ele-

ments of this work include coal characterization using advanced analytical techniques, testing in small-scale reactors and combustors, modeling of fundamental processes by which mineral transformations occur, as well as incorporating an improved understanding of these processes into an engineering model to predict particulate size and composition distributions. The project consists of the following tasks: (1) program planning, management, reporting, and peer review; (2) coal selection preparation and characterization; (3) advanced techniques for coal mineral characterization; (4) fundamental studies of selected ash vaporization, nucleation, condensation, and coagulation phenomena; (5) fundamental studies of mineral matter vaporization and residual ash formation; (6) pulverized coal combustion studies of ash enrichment by volatiles and fragmentation; (7) idealized combustion determination of ash particle formation and surface stickiness; and (8) model development and integration. During this reporting period primary work performed was of an organizational and planning nature. PSI initiated work on Tasks 7 and 8 by: carrying out a conceptual design of the swirl stabilized reactor; and developing a methodology to incorporate the presence of mineral matter and char fragmentation into existing char combustion models. 11 refs., 7 figs., 2 tabs.

15329 (NP—7751262) **Experimental investigation of the formation of nitrogen oxides in combustion of coal dust. 2nd intermediate report covering the period from May 1, 1983 to June 30, 1984.** Kremer, H.; Schulz, W. (Bochum Univ. (Germany, F.R.). Lehrstuhl fuer Energieanlagentechnik). Jun 1984. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87751262.

In order to obtain more knowledge on the mechanism and the kinetics of the formation of NO from the nitrogen in the coal, and on the behaviour of the residual coke together with the components of the stack gas, experiments were carried out in an electrically heated step combustion chamber. The formation of nitrogen oxides in combustion of coal dust is explained in detail, with data on thermal and 'prompt' NO and on NO as gaseous nitrogen and from nitrogen in the residual coke. There is a report on burners and firing low in NO/sub x/ and on experimental plant (heating, air preheater, coal dosing, post-combustion and dust extraction, air supply) and the measuring technique used. Results of investigations on the effect of stoichiometry, wall temperature, dwell time and type of coal on the formation of nitrogen oxide are given for single stage combustion and multistage combustion. A system of equations was set up to describe the NO concentration. (HWJ).

15330 (PNL—5500-Pt.4, pp 3-4) **Analysis of coal and coal liquid combustion products.** Chess, E.K.; Wilson, B.W.; Later, D.W. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The authors have undertaken an analysis of the products of the open air combustion of petroleum- and coal-derived liquid fuels. Initial results indicate that much of the material extracted from the combustion particulate is chemically unaltered relative to that in the initial fuel. Hence, compounds such as amino-polycyclic aromatic hydrocarbons (APAH), as well as certain carcinogenic PAH, appear to simply volatilize and then recondense on carbon-based particulates formed during combustion. The failure of open flames to effect more complete combustion leads to marked differences in the chemical constituency of those petroleum-derived fuels tested as compared to the coal liquids. The coal-derived particulate extracts were slightly more mutagenic in their nitrogen-rich fractions than were the petroleum-derived extracts. These differences appear to be substantially greater than the differences noted for these two types of materials in recent utility combustion tests.

15331 **Experimental and theoretical studies of reverse combustion in porous media.** Visser, W.; Krantz, W.B.; Britten, J.A. (Univ. of Colorado, Boulder, CO). pp 215 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

This paper describes recent experimental and modeling studies of reverse combustion (RC) in consolidated combustible porous media, aimed at the understanding of RC dynamics and channeling behavior in situ coal seams and tar sand deposits.

15332 **Single-particle combustion of Beulah lignite char.** Young, B.C.; McCollor, D.P.; Weber, B.J.; Jones, M.L. (Univ. of North Dakota Energy Research Center, Box 8213, University Station, Grand Forks, ND 58202). pp 266 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

A fundamental study of the combustion behavior of U.S. lignite and subbituminous coal chars was recently initiated at the University of North Dakota Energy Research Center. To accomplish this task a single-particle reactor has been developed in which individual coal char particles are burned in a controlled flameless environment and monitored by non-intrusive techniques.

15333 **A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries.** Dunn-Rankin, D.; Hoornstra, J.; Fletcher, T.H.; Holve, D.J. (Combustion Research Facility, Sandia National Lab., Livermore, CA 94550). pp 160 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

The use of coal/water slurries in heat engines, such as medium speed diesels and turbines, is limited by the relatively long residence time requirements for efficient combustion, and by the fouling and pollutant emission caused by mineral matter in the coal. One of the keys to solving these problems is the control of particle size. The understanding of the evolution of the particle size distribution (PSD) during PC and CWS combustion, and the relation of this evolution to the rank of the coal fuel, is the thrust of this work.

15334 **Predicting devolatilization at typical coal combustion conditions with the distributed-energy chain model.** Niksa, S.; Kerstein, A.R.; Fletcher, T.H. (Mechanical Engineering Dept., Stanford Univ., Stanford, CA 94305). pp 159 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

Hypothetical ultimate yields for rapid coal devolatilization arose from the historical notions that a well-defined amount of volatile precursors are present in coal, and that their rate of release is directly proportional to a decaying reactant concentration. However, recent analyses of coal structure suggest a far less direct relationship between the reactive species in coal and the pyrolysis products. According to the aromatic/hydroaromatic model, bituminous coals are composed of aromatic "nuclei" interconnected by various bridges and substituted with smaller functional groups on their periphery. Bituminous coal is a crosslinked macromolecular network.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 15405, 16153, 16155

0160 Health And Safety

REFER ALSO TO CITATION(S) 15292, 15325, 15330

15335 (CONF-8606161—, pp 17-20) **Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin.** Dankovic, D.A.; Wright, C.W.; Springer, D.L. (Battelle Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Coal-derived complex mixtures (CDCMs) are carcinogenic in mouse skin-painting experiments, with most of the tumor-initiating activity residing in the neutral polycyclic aromatic hydrocarbon (PAH) fraction of the materials boiling above 750°F. The 800-850°F and > 850°F distillates derived from the solvent-refined coal process contain essentially identical concentrations (approximately 1700 ppm) of benzo[a]pyrene (BaP), but differ substantially in tumor-initiating activity. The present study had three goals: to determine the persistence of BaP at the site of application on mouse skin, in the presence and absence of CDCMs; to determine the chemical form of the BaP at the site of application; and to determine the time course of disappearance from the site of application of selected PAH's in the PAH fraction derived from the 800-850°F CDCM. The effects of the 800-850°F and > 850°F materials on the rate of disappearance of BaP from mouse skin was determined by selective extraction of parent PAHs after co-administration of these materials with radiolabelled BaP. The chemical form of the ^{14}C-labelled BaP was determined by reverse-phase HPLC, and the PAHs remaining at the application site were identified and quantified by high-resolution capillary-column gas chromatography.

15336 (CONF-8606161—, pp 25-28) **Complex mixtures: comparative chemical and toxicological characterization.** Stamoudis, V.C.; Picel, K.C.; Haugen, D.A. (Argonne National Lab., IL). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract W-31-109-ENG-38.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Fossil-energy-related complex organic mixtures such as petroleum, shale oil, and coal-conversion products and by-products, have some distinct similarities in composition, as well as some notable differences. The toxicity of such mixtures, as measured by microbial mutagenicity, tends to be low for those of geochemical origin, such as petroleum, and relatively high for coal-conversion products and by-products. Chemical and toxicological data were obtained for three energy-related materials, a by-product oil from the Great Plains commercial gasifier (GPCG); a comparative research material, CRM-1, from the SRC-II coal-liquefaction process; and a shale oil standard reference material (SRM #1580) from the National Bureau of Standards. The materials are compared on the basis of mass and mutagenicity balances for major chemical fractions produced from standardized fractionation procedures. Microbial mutagenicity assays were performed using Salmonella strain TA98 with rat liver S9 metabolic activation.

15337 (CONF-8606161—, pp 41-43) **Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture.** Mahlum, D.D.; Zangar, R.C.; Springer, D.L. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC06-76RL01830.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

For this study pregnant Sprague-Dawley rats and CD-1 mice were treated dermally at doses of 500 to 1500 mg/kg body weight on 11-15 days of gestation with SRC-II heavy distillate. The rats were killed on dg 20 and the mice on dg 18. The uterus was removed and the fetuses were weighed and examined for gross, visceral, and skeletal abnormalities. Results from this study demonstrate considerable similarity between rats and mice with regard to prenatal effects resulting from dermal exposure to a high-boiling complex organic mixture. For both species, growth retardation and cleft palates were observed; however, small lungs were observed only in rats. This species difference may indicate that: (1) constituents responsible for cleft palate are different from those inducing small lungs (2) there are differences in the metabolite profiles between the two species (3) lung development in the rat is more sensitive than in mice to constituents or metabolites from the mixture, or that (4) there are other more generalized metabolic differences between the two species.

15338 (CONF-8606161—, pp 45-47) **Effects of complex organic mixtures of coal liquid on cardiovascular function.** Springer, D.L.; Sasser, L.B.; Zangar, R.C.; Mahlum, D.D. (Battelle Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The most common diseases in the US are those involving the cardiovascular system. Exposure to certain environmental chemicals and complex mixtures may be involved in some aspects of cardiovascular disease. They have previously reported that high-boiling coal liquids resulted in several affects related to the cardiovascular system of the rate when exposed via whole-body inhalation to the mixture. The most striking observation was a dose dependent elevation in arterial blood pressure for heavy distillate (HD) exposed rates compared to control animals at 2 weeks. They also noted an increase in heart rate and plasma and blood volume. Additional rats were evaluated 6 weeks after exposure, to determine whether these effects represented permanent changes in cardiovascular function, and the effects appeared to be reversible after this longer period. During the past year they have completed the assays of the studies initiated previously and have addressed some possible factors which could explain the effects that they observed. Electrolytes in plasma of rats exposed to the HD were analyzed by inductively coupled plasma-atomic emission spectroscopy (ICP-AES). Plasma aldosterone and angiotensin were measured by radioimmunoassays, and plasma cholesterol, triglycerides, and high-density lipoprotein were evaluated with an Abbott VP bichromatic chemistry analyzer. In addition, a comparison of the blood pressure of control rats and rats fed a restricted diet were made, to determine if the anorexia which resulted from HD exposure could be responsible for the changes they observed in cardiovascular function.

15339 (CONF-8606161—, pp 57-59) **Lifetime studies with mice after exposure to a high-boiling complex organic mixture.** Springer, D.L.; Miller, R.A.; Mahlum, D.D. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Previously they reported on a subchronic study in which CD-1 mice were exposed by inhalation to solvent refined coal (SRC)-II heavy distillate. Results indicated that there were dose related increases in liver weights and decreases in thymus weights for middle and high exposure group animals. In addition, decreases were observed in the number of red blood cells, volume of packed red cells and hemoglobin concentration for high-dose animals. Microscopic examination of organ sections showed focal hepatic necrosis, nonspecific hepatopathy and degeneration of olfactory epithelium. Comparison of these effects with those for rats similarly exposed indicated that fewer lesions were present in mice, and that lesions were observed in rats at lower doses than those required to produce effects in mice. In addition to animals for the subchronic study, mice were exposed to similar aerosol concentrations for either 1, 4 or 12 weeks. Statistical evaluation data indicated significant decreases in the survival curves and in body-weight curves for exposed mice. Results for light microscopic examination of these tissues indicated that a significant number of mice exposed to the high and middle doses for 4 and 12 weeks developed alveolar epithelial hyperplasia, alveolar/bronchiolar adenomas and carcinomas. In addition, a significant number of high-dose animals from the 4- and 12-week exposure groups developed skin tumors. In addition, they also observed noncarcinogenic changes in the nasal cavity.

15340 (CONF-8606161—, pp 61-65) **Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results.** Gray, R.H.; Drucker, H.; Massey, M.J.; Craun, J.C.; Fillo, J.P.; Hubis, W.; Reilly, C.A.; Renne, R.A.; Wilson, B.W.; Later, D.W.; Haugen, D.A. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Over the last decade, a substantial data base has been developed concerning the physical, chemical and toxicological properties of coal conversion (liquefaction and gasification) materials. This study evaluated products and byproducts obtained from processes that, in many cases, were operated under a variety of conditions and configurations. Toxicological research on coal-derived materials was performed using a tiered approach. Initially, materials were

screened using a battery of short-term bioassays. Chemical fractionation and detailed chemical analyses were performed on those materials showing toxicological activity to identify the bioactive components. Some materials were subjected to whole-animal studies to evaluate potential carcinogenicity, teratogenicity and/or other toxic effects. Again, chemical fractionation and detailed chemical analyses were used to identify components of those materials that were of greatest concern. This has been termed the biodirected approach. They recently completed a major effort to compile, integrate and evaluate the chemical, physical, toxicological and engineering data base that was developed. This paper summarizes the results of this effort and indicates those properties/characteristics of coal conversion materials that most directly relate to toxicological effects. 8 references, 2 figures.

15341 (CONF-8606161—, pp 81-84) **Initiation-promotion studies with complex mixtures.** Mahlum, D.D. (Battelle Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The authors have tested coal-derived distillates with boiling ranges for their effect on BaP initiating activity to determine if higher boiling materials are more effective inhibitors of benzo[a]pyrene (BaP) initiating activity than are the lower boiling distillates. Twenty-five μg of BaP was applied to the backs of female mice in the presence of 5 mg of coal liquid distillates. The distillate boiling from 300-700° had no effect on BaP expression. However, the 700-750°, 750-800° and the 800-850°F distillates all inhibited BaP expression. The results with the > 850° distillate are not easily interpreted since the distillate itself had substantial activity. They have attempted to determine if the inhibition activity resides with a particular chemical class. They therefore fractionated the 750-800°F distillate into aliphatic, neutral polycyclic aromatic hydrocarbon (PAH), nitrogen-containing polycyclic aromatic compound (NPAC), and hydroxy-PAH (HPAH) fractions. Results indicate that the PAH and NPAC fractions as well as the parent distillate significantly inhibited BaP expression. Studies evaluating the tumorigenic activity of coal-derived distillates using initiation-promotion and chronic skin assays in the mouse have demonstrated that activity increases with increased boiling range. Results from the two assays suggest that distillates boiling from 700-750° and 750-800°F may be relatively more active in the chronic skin painting assay than in the initiation-promotion assay. They speculated that this may be due to a greater number of cells being initiated by the repeated application of test material used in the chronic painting protocol. In all cases, the animals initiated with multiple doses had a higher response than did those that received one dose even though the total amount of test material was the same.

15342 (CONF-8606161—, pp 85-87) **Tumor-promoting activity of complex organic mixtures.** Haugen, D.A.; Peraino, C. (Argonne National Lab., IL). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract W-31-109-ENG-38.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

To test the tumor-promoting activity of complex organic mixtures, they are using a hepatic initiation-promotion model in which newborn rats are treated once with a sub-hepatotoxic amount of tumor-initiator followed after weaning by treatment with a putative promoter. At 11-12 weeks of age, the rates are sacrificed and the livers are analyzed histochemically for foci of altered cells, indicated by the presence of gamma-glutamyl transpeptidase (GGT). They found earlier that, as for dietary treatment with phenobarbital, twice-weekly topical treatment with either a complex coal liquid heavy distillate or a coal gasifier tar of similar compositions enhanced the appearance of GGT-positive foci for rats treated at birth with either of the tumor promoters diethylnitrosamine (DEN) or benzo[a]pyrene. Topical treatment of the rats did not cause dermal tumorigenesis and did not cause the appearance of hepatic foci in animals that were not treated with initiator at birth. The results demonstrated that (a) promotion of tumorigenesis in internal organs can be a consequence of dermal exposure to energy-related complex mixtures, (b) the rat liver hepatocarcinogenesis model allows detection of tumor-promoting activity in mixtures that also contain tumor-initiating activity, and (c) that there may be as yet unidentified tumor promoters in energy-related complex mixtures. They are conducting a further study to determine whether topical treatment with a coal liquid heavy distillate of rats treated with DEN at birth produces hepatic tumors by 180-200 days, as well as preneoplastic foci by 70-80 days.

15343 (CONF-8606161—, pp 115-120) **Effects of highly aromatic complex chemical mixtures on the mutagenicity of amino-PAH, nitro-PAH and the intercalating agent, ICR191.** Pelroy, R.A.; Stewart, D.L. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Previous work suggested that mixtures of 6-aminochrysene (6-AC) and complex chemical mixtures for high-boiling coal liquids (CL) were more mutagenic than 67-AC alone, or the complex mixtures alone. The work presented here extends this observation to other amino-polycyclic aromatic hydrocarbons (amino-PAH) and also to mutagens (or premutagens) differing from the amino-PAH in their requirements for metabolic activation. In particular, results are presented for nitro-polycyclic aromatic hydrocarbons (nitro-PAH) and for the heterocyclic intercalating agent, ICR191, a direct-acting mutagen requiring no metabolic activation. 6 tables.

15344 **(CRIEPI—484007) Response of small laboratory animals to coal fly ash inhalation.** Kamihira, M. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan)). 1986. vp. (In Japanese). NTIS.

Properties of lung surfactant of golden hamsters exposed to fly ash, 5 mg/m, for 10 hours/day 7 days/week for 3 weeks were examined. Exposed group showed lower maximum value of surface tension than sham-exposed group, and minimum value in exposed group was higher than in sham-exposed group. So stability index (S.I.) obtained from the surface tension of lung extracts in exposed group was lower than in sham-exposed group; the difference between the 2 S.I. values was small but statistically significant. In addition, the bubble stability ratio (S.R.) in exposed group tended to be lower than in sham-exposed group.

15345 **Monitoring exposure to polynuclear aromatic compounds via room temperature phosphorescence from solid substrates.** Vo-Dinh, T.; Gammage, R.B. (Oak Ridge National Lab., TN). *Radiation Protection Dosimetry;* 6: No. 1-4, 137-140([1987]). Contract W-7405-ENG-26.

Room Temperature Phosphorescence (RTP) Spectroscopy is a relatively new solid state luminescence technique for monitoring polynuclear aromatic (PNA) compounds. The RTP technique can detect a variety of PNA pollutants at subnanogram levels. Practical applications include rapid and cost-effective screening of PNA species in complex samples and direct reading detection of airborne PNA compounds collected on a new type of personnel vapor dosemeter. 10 references, 3 figures.

0170 Legislation And Regulations

15346 **Regulation of surface subsidence in West Virginia.** Meador, S. pp 6-8 of Proceedings, 2nd workshop on surface subsidence due to underground mining. Peng, S.S. (ed.). Morgantown, WV; West Virginia University (1986). (CONF-8606249—).

From 2. workshop on surface subsidence due to underground mining; Morgantown, WV, USA (9 Jun 1986).

This paper concerns the regulation of coal mining in West Virginia which is similar to the Federal Surface Mining Control and Reclamation Act as well as other states' statutes. However certain legal and administrative issues combine to make West Virginia's regulation of surface subsidence a singular approach. The evolution of subsidence regulations, administrative issues and legal issues are discussed. 3 references.

02 PETROLEUM

REFER ALSO TO CITATION(S) 16159

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 16153

15347 **Low radioactivity spectral gamma calibration facility.** Mathews, M.A.; Bowman, H.R.; Huang, L.; Lavelle, M.J.; Smith, A.R.; Hearst, J.R.; Wollenberg, H.A.; Flexser, S. (Los Alamos National Lab., Los Alamos, NM). pp 15 of Proceedings of the twenty-seventh annual logging symposium. Houston, TX; Society of Professional Well Log Analysts Inc. (1986). (CONF-8606105—).

From 27. annual logging symposium of the Society of Professional Well Log Analysts; Houston, TX, USA (9 Jun 1986).

A low radioactivity calibration facility has been constructed at the Nevada Test Site (NTS). This facility has four calibration models of natural stone that are 3 ft in diameter and 6 ft long, with a 12 in. cored borehole in the center of each model and a lead-shielded run pipe below each model. These models have been analyzed by laboratory natural gamma ray spectroscopy (NGRS) and neutron activation analysis (NAA) for their K, U, and Th content. Also, 42 other elements were analyzed in the NAA. The /sup 222/Rn emanation data were collected. Calibrating the spectral gamma tool in this low radioactivity calibration facility allows the spectral gamma log to accurately aid in the recognition and mapping of subsurface stratigraphic units and alteration features associated with unusual concentrations of these radioactive elements, such as clay-rich zones.

15348 **Calculation of gravimetric density caused by three-dimensional structure.** Hearst, J.R.; Carlson, R.E.; Clark, S.R. (Lawrence Livermore National Lab., Livermore, CA). pp 22 of Proceedings of the twenty-seventh annual logging symposium. Houston, TX; Society of Professional Well Log Analysts Inc. (1986). (CONF-8606105—). Contract W-7405-ENG-48.

From 27. annual logging symposium of the Society of Professional Well Log Analysts; Houston, TX, USA (9 Jun 1986).

For many years the authors have been comparing measured and calculated gravimetric density from a gamma-gamma density log to infer subsurface structure. They have used two-dimensional models, usually geologists' cross sections, to provide input for calculation of corrected gravimetric density for comparison with measured gamma-gamma density. Often the real structures could be better described in three dimensions. The difficulty with calculating the gravitational effect of three-dimensional structure is not in the calculation itself, but in the description of the structure such that it fills all space and does not contain voids. They solve this problem by using contour maps of subsurface boundaries between media of different density. The contour lines are digitized, and the digitized data are used to construct a function that is then evaluated over a fine grid surrounding the bore-hole. The algorithm used to construct the approximating function is a modification of Hardy's multiquadric method for interpolating scattered data. The edges of the grid are smoothed, and then extended to distances great enough to be effectively infinite in the gravity calculation. The gravity calculation uses an algorithm by Banerjee and Gupta for the calculation of the gravitational effect of a right rectangular prism.

15349 **Evaluation and design of a large spacing loop-loop electromagnetic tool.** Harben, P.E.; Rodgers, P.W.; Holladay, G. (Lawrence Livermore National Lab., P.O. Box 5504, L-156, Livermore, CA 94550). pp 21 of Proceedings of the twenty-seventh annual logging symposium. Houston, TX; Society of Professional Well Log Analysts Inc. (1986). (CONF-8606105—).

From 27. annual logging symposium of the Society of Professional Well Log Analysts; Houston, TX, USA (9 Jun 1986).

This paper investigates the potential use of a large spacing loop-loop electromagnetic logging tool to detect resistivity anomalies as far as 25 meters away from the borehole wall. A three-dimensional whole space electromagnetic modelling code was used to evaluate the responses of such a tool to various transmitter and receiver loop orientations, operating frequencies, loop spacings, resistivity contrasts, anomaly sizes and anomaly distances. Anomalies were modeled as finite extent sheets of various thicknesses which terminated before intersecting the borehole wall. It was found that both coplanar and coaxial loop orientations provide strong anomaly responses, but the coaxial loop orientation has superior depth penetration and is a less complex tool to design and build. For such a coaxial tool, anomalies could be detected as far from the borehole wall as half the loop spacing. For rock resistivities on the order of 100 ohm-m, contrasts greater than 2:1 and loop spacings of 75 meters the optimal operating frequency is shown to be 10 kHz. At these loop spacings, anomalies must be thicker than 10 meters to be detected. It is further shown that for coaxial loops the nature of the response curves allows one to estimate the distance of an anomaly from the borehole wall although no angular location is possible.

15350 **Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas.** Langmuir, D.; Melchior, D. (Colorado School of Mines, Golden). *Geochimica et Cosmochimica Acta;* 49: No. 11, 2423-2432(Nov 1985).

The geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro Basin of north Texas, was studied to define geochemical controls on radionuclides such as ^{90}Sr and ^{226}Ra. Published solubility data for gypsum, anhydrite, celestite, barite and $RaSO_4$ were first reevaluated, in most cases using the ion interaction approach of Pitzer, to determine solubility products of the sulfates as a function of temperature and pressure. Ionic strengths of the brines were from 2.9 to 4.8 m, their temperatures and pressures up to 40°C and 130 bars. Saturation indices of the sulfates were computed with the ion-interaction approach in one brine from the arkosic granite wash facies and four from the carbonate Wolfcamp Formation. All five brines are saturated with respect to gypsum, anhydrite and celestite, and three of the five with respect to barite. All are undersaturated by from 5 to 6 orders of magnitude with respect to pure $RaSO_4$. ^{226}Ra concentrations in the brines, which ranged from 10/sup -11.3/ to 10/sup -12.7/ m, are not controlled by $RaSO_4$ solubility or adsorption, but possibly by the solubility of trace Ra solid solutions in sulfates including celestite and barite.

15351 **Cenozoic fluctuations in biotic parts of the global carbon cycle.** Olson, J.S. (Environmental Sciences Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 377-396 of The carbon cycle and atmospheric CO/sub 2/: Natural variations Archean to present. Sundquist, E.T.; Broecker, W.S. Washington, DC; American Geophysical Union (1985). (CONF-840181—).

From American Geophysical Union Monography meeting on carbon dioxide through geologic time; Tarpon Spring, FL, USA (15 Jan 1984).

The mass of organic carbon in land plants presumably decreased over much of Tertiary time. Global average cooling, mountain building, rain shadows, and other drying displaced forests and led to the expansion of shrublands, grasslands and deserts. Quaternary cold repeatedly stimulated the expansion of tundra and cold deserts. Lowering of sea level partly compensated with new areas for coastal and wetland vegetation. Interglacial and postglacial ice retreats opened new lands for boreal, mostly conifer forests (taiga), and for renewed storage of peat in mires. Early Holocene broad-leaved forests expanded again (along with temperate and humid tropical/subtropical climates) and constitute most of the world's plant carbon mass. Slightly less than 800 10/sup 9/ metric tons C is a plausible estimate in all live land plants in mid-Holocene time. Variations from this estimate by a factor of about 2 seem likely within the late Cenozoic Era: higher in early Miocene and lower in glacial times; 460-660 x 10/sup 9/ metric tons C from A.D. 1980 to —1780 A.D.

15352 **Simulation experiments with Late Quaternary carbon storage in mid-latitude forest communities.** Solomon, A.M.; Tharp, M.L. (Environmental Sciences Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 235-250 of The carbon cycle and atmospheric CO/sub 2/: Natural variations Archean to present. Sundquist, E.T.; Broecker, W.S. Washington, DC; American Geophysical Union (1985). (CONF-840181—).

From American Geophysical Union Monography meeting on carbon dioxide through geologic time; Tarpon Spring, FL, USA (15 Jan 1984).

The assumption was tested that forest biomass in communities on the modern landscape is equivalent to that in similar communities on the late Quaternary landscape. Forest carbon storage dynamics during the past 16,000 years were derived from a mathematical model of forest processes and individual tree species behavior. Modern pollen and climate data sets provided pollen-climate transfer functions to generate model driving variables from fossil pollen records. Climate variables were estimated from fossil pollen stratigraphies in Tennessee, Ohio, and Michigan. Only simulated early postglacial warming produced the large carbon gains one would expect in mixed deciduous-coniferous forests from unglaciated regions. The simulated mid-Holocene warming generated little carbon storage response by temperature deciduous forests and large carbon gains in northern hardwood-conifer forests, unlike the linear relationship expected when equivalence is assumed between modern and prehistoric forests. Late-glacial, mid-latitude forests may have contained more biomass than would be expected from equivalent forests on the modern landscape. Simulations of alternate hypotheses to explain the enhanced late glacial biomass cannot distinguish effects of reduced seasonal temperature extremes from effects of changing species' temperature tolerances.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 15367

15353 **(DOE/BC—86/1) Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985.** (USDOE Bartlesville Project Office, OK). Dec 1986. 119p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86000294.

Progress reports are presented for field tests and supporting research for the following: chemical flooding; gas displacement; thermal methods; resource assessment; environmental technology; and microbial enhanced oil recovery. (AT)

15354 (DOE/BC—86/2/SP, pp 17.47-17.69) **Experimental study of waterflooding from a 2-D layered sand model.** Ahmed, G. Mar 1986. NTIS, PC A16/MF A01. File Number DE86000278.

In Second amendment and extension to Annex IV enhanced oil recovery thermal processes.

This study is a continuation of earlier work on gas-surfactant flow through a bench-scale, unconsolidated sandpack. The report outlines the latest attempts of gas-surfactant simultaneous flow through porous media under conditions where foam forms over only a portion of the model.

15355 **(DOE/MC/22044—3) Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986.** Durham, D.L. (West Virginia Univ., Morgantown (USA)). Feb 1987. Contract AC21-85MC22044. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005310.

The objective of this study is to develop a process that will increase ultimate oil recovery and will improve the operational economics of CO_2 flooding over current state-of-the-art practices. The specific goals of the research work are: to determine and evaluate the optimum conditions and materials for chemical precipitation over a realistic range of reservoir pressures and temperatures; to evaluate the permeability alteration by in-situ chemical precipitation in core samples; to extend the laboratory results to predict the outcome of the field application by modeling and computer simulation; and to determine the expected increase oil recovery through application of the in-situ precipitation to a specific target reservoir. During year one, the following tasks and subtask were completed: Task I - technology review; Task II - experimental design, construction and calibration; and subtask I - precipitation formation of Task III. Accomplishments for these tasks are discussed. The comparison of the ambient and PVT cell test results of precipitation formation indicate that both $CaCl_2$ and $BaCl_2$ have potential for use in core tests. However, at this time the $BaCl_2$ appears to be the better choice. 4 tabs.

15356 **(NP—7900486) 1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report.** Donahoe, R.J. (Alabama Univ., University (USA). School of Mines and Energy Development). Sep 1986. 50p. School of Mines and Energy Development, Box 6282, University of Alabama, Tuscaloosa, AL 35486. File Number TI87900486.

A low-temperature hydrothermal flow-through study was conducted experimentally examine fluid/rock interactions brought about in sandstones as a result of fluid injection enhanced oil recovery (EOR) methods. Such studies will eventually enable the development of a predictive model for fluid injection EOR methods. The design of the low-temperature hydrothermal flow-through system allows the accurate control of fluid flow rate (0.002-10 ml/min), temperature (0 to 300°C) and pressure (1 to 500 bar) while flowing fluids through disaggregated solid samples. Samples of St. Peter Sandstone and two different sandstones of the Norphlet Formation from southern Alabama were interacted with distilled, deionized water and a 1% HCl solution at 250°C, 300 bar and 0.1 or 0.5 ml/min fluid flow rate. Solids were analyzed by x-ray powder diffraction and scanning electron microscopy. Fluid samples were analyzed by atomic absorption spectrophotometry and combination pH electrode. A variety of processes which occur in sandstones subjected to fluid injection EOR methods were documented experimentally. Processes damaging to reservoir permeability included iron fouling, silica fouling, migration of clay fines, and precipitation of other secondary phases. Processes resulting in reservoir stimulation involved the dissolution of sandstone framework and/or authigenic mineral constituents. The most successful fluid injection stimulation can be expected for arkosic sandstones containing high percentages of K-feldspar and illite relative to kaolinite, chlorite and smectite, using dilute HCl injection solutions and high fluid flow rates. Fluid chemical data indicate that equilibrium between the solid and injection fluid is not approached for any of the experiments. Therefore, it does not appear that chemical equilibrium computer programs can be used to model these low-temperature reactions. 12 refs., 11 figs., 4 tabs.

15357 **Potential of enhanced oil recovery.** Stosur, J.J.G. (Department of Energy, Washington, DC, USA). *International Journal of Energy Research;* **10**: No. 4, 357-370(Oct-Dec 1986).

This paper presents results of a comprehensive analysis of enhanced oil recovery (EOR) potential in the United States for the rest of this century and beyond with respect to potential rates and ultimate oil recovery. The analysis is based on a resource database consisting of over 2500 reservoirs with approximately 325 billion barrels of the original oil in place and considers two technology cases: a base economic case and an advanced technology case, both with variable oil price assumptions and discounted cash flow rate of return. The results include EOR potential in the United States in terms of ultimate oil recovery and production rate to the year 2013 for each major EOR group of technologies and under varying economic and technological scenarios. The main conclusion of the study indicates that EOR could increase the current domestic crude reserves by approximately 40 per cent for the base case and nearly double the production rate for the implemented technology case.

15358 **Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations.** Gao, H.W.; Lorenz, P.B.; Brock, S. (National Institute for Petroleum and Energy Research, Bartlesville, OK 74005). pp 685-693 of Polymeric materials science and engineering. Washington, DC; American Chemical Society (1986). (CONF-860911—).

From 192. American Chemical Society national meeting; Anaheim, CA, USA (7 Sep 1986).

Water-soluble polymers such as polyacrylamides and polysaccharide biopolymers have been used increasingly in many chemical flooding (polymer, micellar/polymer, and alkaline/polymer) projects as mobility control agents to improve sweep efficiency for enhanced oil recovery. Improvement in sweep efficiency is achieved by reduction in water mobility, an increase in water viscosity and/or a reduction in water permeability. Successful use of polymers in any enhanced oil recovery (EOR) process requires understanding polymer rheological behaviour and interactions of the polymers and porous media under reservoir conditions. The purpose of this paper is to explore how these phenomena are affected by changes in polymer and salt concentration, using the polyacrylamide Pusher-500 and a Berea sandstone core.

15359 **Accurate vaporizing gas-drive minimum miscibility pressure prediction.** Benmekki, E.H.; Mansoori, G.A. (Univ. of Illinois). pp 19-30 of Proceedings of the SPE Eastern regional conference. Richardson, TX; Society of Petroleum Engineers (1986). (CONF-861198—).

From Society of Petroleum Engineers eastern regional conference: technology for the economic challenge; Columbus, OH, USA (12 Nov 1986).

Prediction of The Minimum Miscibility Pressure (MMP) of the Vaporizing Gas Drive (VGD) process is modeled using an equation of state with different mixing rules joined with a newly formulated expression for the unlike-three-body interactions between the injection gas and the reservoir fluid. The comparison of the numerical results with the available experimental data indicates that an equation of state alone overestimates the MMP. However, when the equation of state is joined with the unlike-three-body interaction term, the MMP will be predicted accurately. The proposed technique is used to develop a simple and reliable correlation for the accurate vaporizing gas drive MMP prediction.

15360 **Economic evaluation of a CO/sub 2/-enhanced oil recovery flood at the Rock Creek Field, Roane County, West Virginia.** Brummert, A.C.; Ammer, J.R.; Watts, R.J.; King, P.; Boone, D.A. (U.S. DOE/METC). pp 299-308 of Proceedings of the SPE Eastern regional conference. Richardson, TX; Society of Petroleum Engineers (1986). (CONF-861198—).

From Society of Petroleum Engineers eastern regional conference: technology for the economic challenge; Columbus, OH, USA (12 Nov 1986).

The Morgantown Energy Technology Center and The Pennzoil Exploration and Production Company have predicted the recovery and economic potential of a full-field, miscible carbon dioxide, enhanced oil recovery flood at the Rock Creek Oil Field, Roane County, West Virginia. Data used in this evaluation were obtained from two miscible carbon dioxide Rock Creek Field tests: (1) a pilot test consisting of two contiguous, normal five-spot patterns, each containing 10 acres (4 ha), and (2) a 1.55-acre (0.63 ha), normal, four-spot minitest. Core data from the eight injection wells and three observation wells were used to determine reservoir input parameters, and fluid samples were analyzed to obtain fluid properties and determine minimum miscibility pressure. A miscible carbon dioxide predictive model was used to calculate oil recovery and project economics. The base-case run showed that an oil price of $39 per barrel ($245 per cubic meter) was required to produce a 15 percent discounted cash flow rate-of-return. A sensitivity study was then conducted on operating parameters (e.g., pattern size, water-alternating gas ratio, total hydrocarbon pore volumes of water-alternating gas injected, and injection rate) and economic parameters (e.g., oil price and carbon dioxide cost) to determine their effect on project performance and project economics.

0204 Processing

REFER ALSO TO CITATION(S) 15295

15361 **Upgrading heavy feedstocks.** Speight, J.G. (Western Research Institute, Laramie, WY 82071). *Annual Review of Energy;* **11:** 253-274(1986).

Heavy oils and residua, once little used as refinery feedstocks, are now the norm. These unconventional feedstocks present special challenges to the petroleum industry, especially in reducing the inherently high yields of coke. This chapter is a review of the occurrence and properties of heavy oils and residua and also reviews current and future options for refining these materials.

0205 Products And By-products

REFER ALSO TO CITATION(S) 16229, 16230, 16231, 16232

0206 Health And Safety

REFER ALSO TO CITATION(S) 15336, 15345

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 16155, 16170

15362 **(ORNL/TM—10198) Sensitivity analysis of ORION.** Reister, D.B.; Wright, R.Q. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 102p. NTIS, PC A06/MF A01. File Number DE87005276.

The replacement cost of oil is the constant selling price that will recover the full expenses of exploration, development, and production of domestic crude oil with a reasonable return on capital. The computer code ORION calculates the replacement costs of oil for 20 regions of the United States: 6 onshore regions and 14 offshore regions. The replacement cost depends on parameters like the finding rate for oil, capital costs, operating costs, tax rates, and the discount rate. This report presents the results of a sensitivity analysis of ORION. In the analysis, sensitivity coefficients were calculated for all of the parameters in ORION; the coefficients are defined to be the ratio of the percentage change in the replacement cost to the percentage change of a parameter. The sensitivity analysis of ORION was performed using an automated procedure based on the GRESS precompiler. For both the offshore and onshore regions, the parameter with the largest sensitivity coefficient was the discount rate. The sensitivity coefficient for the discount rate is approximately equal to the lead-time. Since the lead-times are 3 years for the onshore regions and 5 to 15 years for the offshore regions, the discount rate coefficients can be significantly larger than 1.0. For the onshore regions, parameters related to oil production (like the reserve discoveries and the number of exploratory wells) had large sensitivity coefficients. For the offshore regions, a weather parameter had large sensitivity coefficients. 4 refs., 16 tabs.

0208 Waste Management

REFER ALSO TO CITATION(S) 16221, 16222

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 16711, 16757, 16758

15363 **(MMS—86-0127-Vol.1) Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1.** (Minerals Management Service, Washington, DC (USA)). Jan 1987. 819p. Minerals Management Service, 18th and C Streets, NW, Washington, DC 20240. File Number TI87900476.

This final environmental impact statement considers adoption of a proposed 5-year (Mid-1987 to Mid-1992) Outer Continental Shelf (OCS) oil and gas leasing schedule of 41 oil and gas lease sales in 21 planning areas on the OCS. The proposed schedule consists of 4 sales in the Atlantic Region, 12 sales in the Gulf of Mexico Region, 6 sales in the Pacific Region, 15 sales in the Alaska Region, and 5 small annual supplemental sales. Ten other alternatives and summaries are also described. Impacts to the environment could be caused by oil spills, discharges of drilling fluids, muds, cuttings, formation waters, sanitary wastes, and emissions of pollutants from platforms, refineries and well blowouts. Additional impacts could be caused by physical alteration of the seafloor, land use competition, and social and economic disruption in affected coastal areas. States which could be affected by the proposed action are: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, California, Oregon, Washington, and Alaska. Contents of Volume I include: (1) purpose and need for action; (2) alternatives including the proposed action; (3) affected environment; and (4) environmental consequences by planning area - north Atlantic, mid-Atlantic and south Atlantic.

0230 Properties

REFER ALSO TO CITATION(S) 15295, 15361

03 NATURAL GAS

REFER ALSO TO CITATION(S) 16159

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 15347, 15348, 15349, 15351, 15352

15364 **Continuous mixture computational algorithm of reservoir fluid phase behavior applicable for compositional reservoir simulation.** Du, P.C.; Mansoori, G.A. (Univ. of Illinois). pp 281-288 of Proceedings of the SPE Eastern regional conference. Richardson, TX; Society of Petroleum Engineers (1986). (CONF-861198—).

From Society of Petroleum Engineers eastern regional conference: technology for the economic challenge; Columbus, OH, USA (12 Nov 1986).

Development of compositional reservoir simulators is presently hampered due to the complexity of the existing computational algorithms of reservoir fluid phase behaviour calculations. Through the application of the theory of polydisperse fluid mixtures the authors have been able to develop a number of algorithms for phase behaviour calculations. In the present report they introduce one of such algorithms. In this algorithm reservoir fluid is considered to consist of a continuous mixture with a defined molecular weight/composition distribution function. Computational computer time required for the new algorithm is shown to be one order of magnitude smaller than the existing algorithms. As an example, the new algorithm is used to perform retrograde condensation calculations for two different gas-condensate reservoir fluids. Comparisons of experimental data with the calculated results indicate good agreement between the two.

15365 **A reexamination of the tropospheric methane cycle: Geophysical implications.** Senum, G.I.; Gaffney, J.S. (Environmental Chemistry Div., Dept. of Applied Science, Brookhaven National Lab., Upton, NY 11973). pp 61-69 of The carbon cycle and atmospheric CO/sub 2/: Natural variations Archean to present. Sundquist, E.T.; Broecker, W.S. Washington, DC; American Geophysical Union (1985). (CONF-840181—).

From American Geophysical Union Monography meeting on carbon dioxide through geologic time; Tarpon Spring, FL, USA (15 Jan 1984).

Existing data concerning sources, sinks, and natural isotopic (/sup 13/C, D, /sup 14/C) abundances of atmospheric methane, a greenhouse gas, are reexamined in light of recent indications of an increasing global atmospheric methane burden. This increase has important geophysical implications with regard to greenhouse effects. Previous evaluations have been revised by updating bacteria source terms and the hydroxyl sink terms. Microorganism-derived source rates have been lowered from 700 +- 130 to 300 +- 140 x 10/sup 12/ g yr/sup -1/. Sink rates for atmospheric methane are dropped from 635 +- 30 to 280 +- 60 x 10/sup 12/ g yr/sup -1/. The revised budget is examined with relation to the known δ/sup 13/C, δD and /sup 14/C methane abundances and found to be in reasonable agreement, with recent biogenic source terms accounting for 80-90% of the observed increase. Although there are limited data, existing δ/sup 13/C and δD yearly trends support this observation. Future needs for measurements are discussed in light of this budget.

0304 Products And By-products

REFER ALSO TO CITATION(S) 15587, 15588, 15589, 16229, 16230, 16231, 16232

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 15368, 15588

15366 **(DOE/OR/00033—T253) Multistate EIA-857 respondent report 1984: Final report.** Boercker, S.W. (Oak Ridge Associated Universities, Inc., TN (USA)). Sep 1986. Contract AC05-76OR00033. 92p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87004880.

Among companies responding to EIA-857, "Monthly Report of Natural Gas Purchases and Deliveries to Consumers," there are 43 companies that file responses for operations in more than one state. In many such cases, one individual completes all EIA-857 forms for the entire company and another individual completes all EIA-176 forms. In some cases, one person is responsible for completing both EIA forms. Therefore, one or two phone calls may serve to reconcile data on several forms. Seven of the multistate responding companies filed matching 1984 data for each state. These respondents are noted on Table 1, which lists all multistate respondents. No further information is given concerning companies that file matching data on all EIA-857 and EIA-176 responses. For each company that files any data that do not agree within 500 Mcf, a sheet describing the company and giving sums of data for the entire company is followed by slightly revised copies of the company sheets included in the "State Reports on Companies Reporting Different 1984 Data on EIA-857 and EIA-176." These company reports are in alphabetical order, and within a company report, responses are arranged in order of decreasing differences in volumes.

0307 Waste Management

REFER ALSO TO CITATION(S) 16155

0308 Environmental Aspects

REFER ALSO TO CITATION(S) 15363, 16757, 16758

0309 Artificial Stimulation

15367 **(SAND—86-1865) A numerical signal processing technique for borehole seismic fracture diagnostics.** Engi, D. (Sandia National Labs., Albuquerque, NM (USA)). Jan 1987. Contract AC04-76DP00789. 86p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005623.

The potential economic value of determining the geometry of hydraulic fractures for reservoir engineering is well established. Borehole seismic systems utilizing the polarization method of analysis have been successfully employed in numerous hydraulic fracture mapping experiments. The sensor for the borehole seismic system is a tool consisting of three sets of orthogonally oriented geophones that sense the magnitude of the rectilinear components of seismic signals from which the direction of incidence of the seismic signal

can be determined. This paper describes the methods for analyzing this angular data and for combining the data from more than one tool into a single estimate of the location of the origin of the seismic signal. 9 refs., 26 figs., 8 tabs.

0320 Transport, Pipelines, And Handling

15368 **(CONF-8604218—7) Applications of economic analysis in gas distribution.** Wilson, G.G. (Institute of Gas Technology, Chicago, IL (USA)). Apr 1986. 26p. Institute of Gas Technology, 3424 South State Street, Chicago, IL 60616. File Number TI87900441.

From American Gas Association: distribution/transmission conference; Chicago, IL, USA (28 Apr 1986).

This is a summary of the results of a survey of current applications of economic analysis by 19 gas distribution companies. It covers all areas of activity in which economic analysis is likely to be used.

0340 Combustion

15369 **Combustion-torch ignition: Fluorescence imaging of NO/sub 2/.** Cattolica, R.J. (Sandia National Labs.). pp 26 of Proceedings of the 21st symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

Combustion-torch ignition of a lean methane-air mixture (phi=0.65) in a divided-chamber combustion vessel was studied using planar-induced fluorescence imaging of nitrogen dioxide (NO/sub 2/) doped into the reactants at a trace concentration (700 ppm). In the experiments the gas velocity of the combustion torch was systematically increased by reducing the diameter of the exit orifice of the prechamber used to form the torch. With this increase in velocity, the character of the flow field of the combustion torch was altered from laminar to turbulent conditions with the Reynolds number increased from 4290 to 17183. At the highest Reynolds number condition, significant enhancement of the rate of combustion was indicated by factor of 10 to increase in the rate of pressure rise and a 20 percent increase in peak pressure in the combustion chamber. This enhanced combustion rate is a consequence of mixing the combustion products from the combustion torch with unburned reactants. Reactive intermediate species, high-temperature gas and turbulent fluid motion in the combustion products have all been suggested as important elements in enhancing combustion with torch ignition. The NO/sub 2/ fluorescence-imaging measurements indicate that intermediate radicals and high-temperature gas from the combustion torch do not initiate any significant chemical reaction in the unburned reactants ahead of the propagating flame, which could enhance the rate of combustion.

15370 **High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame.** Farrow, R.L. (Sandia National Labs.). pp 14 of Proceedings of the 21st symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

The authors have used a high-resolution (0.005 cm/sup -1/) coherent anti-Stokes Raman spectroscopy (CARS) experiment to obtain fully resolved CARS spectra in a flame. Spectra of Q-branch transitions of CO and O-branch transitions of N/sub 2/ were analyzed to obtain J-dependent Raman linewidths. The CO linewidths are compared to infrared P- and R-branch linewidths measured by other workers in similar rich methane/air flames. The results demonstrate the utility of high-resolution CARS in providing needed spectral information for applying conventional CARS to combustion environments.

04 OIL SHALES AND TAR SANDS

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 15371

0403 Drilling, Fracturing, And Mining

REFER ALSO TO CITATION(S) 15371

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 15373

15371 **(DOE/METC—87/6073) Proceedings of the 1986 tar sands symposium.** Westhoff, J.D.; Marchant, L.C. (eds.). (USDOE Morgantown Energy Technology Center, WV; EG and G/Washington Analytical Services Center, Inc., Morgantown, WV (USA)). Oct 1986. 526p. (CONF-860717—). NTIS, PC A23/MF A01; 1; GPO Dep. File Number DE87001002.

From 2. tar sand symposium; Jackson, WY, USA (8 Jul 1986).

The 1986 Tar Sand Symposium was sponsored by the Laramie Project Office of the Morgantown Energy Technology Center, US Department of Energy, and hosted by the Western Research Institute, University of Wyoming Research Corporation, in Jackson, Wyoming, on July 7 to 10, 1986. The 10-session symposium included 36 presentations describing research, development, and commercial application of tar sand technologies of the US, Canada, the Federal Republic of Germany, Switzerland, and Venezuela. Over 80 participants represented the US, Canada, Germany, Japan, and Switzerland. The papers printed in the proceedings have been reproduced from camera-ready manuscripts furnished by the authors. The papers have not been referred, nor have they been edited extensively. All papers have been processed for inclusion in the Energy Data Base.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 15331, 15371

15372 **(NP—7770047) Origins of the Messel oil shale and structure of petroporphyrins.** Springer, G. (Hannover Univ. (Germany, F.R.). Fachbereich Chemie). 13 Feb 1985. 209p. (In German). NTIS (US Sales Only), PC A10/MF A01. File Number DE87770047.

Porphyrins, which are ubiquitous in sediments, occur in the Messel region almost exclusively as vanadyl or nickel complexes. They are assumed to be derivatives of chlorophyll a and b. Their occurrence in this form is not considered as a phenomenon of biological significance but rather as the result of a process of selection. According to this point of view, the quantitative ratio of the vanadyl and nickel prophyrins should be reflected at least qualitatively by the vanadium/nickel ratio at the site. This is not the case in the Messel oil shale which has about equal vanadium and nickel concentrations but contains exclusively nickel-coordinated porphyrins. The recent observation that the methanogenic bacteria occurring in the anaerobic zones of sediments produce porphinoid nickel complexes by a process of biosynthesis suggests that a biological origin of the nickel central atoms cannot be excluded.

15373 **(UCRL—53273-Rev.1) Assay products from Green River oil shale.** Singleton, M.F.; Koskinas, G.J.; Burnham, A.K.; Raley, J.H. (Lawrence Livermore National Lab., CA (USA)). 18 Feb 1986. Contract W-7405-ENG-48. 206p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE87005924.

Data from 66 material-balanced assays conducted at Lawrence Livermore National Laboratory, Laramie Energy Technology Center, and The Oil Shale Corporation were compiled and analyzed to determine the pyrolysis stoichiometry for Green River for-

mation oil shales originating in and near the Mahogany zone. Shale samples came from four sites in Colorado and one in Utah, and ranged in oil content from 12 to 258 L/Mg (3 to 62 gal/ton). Average values and pairwise correlation coefficients are reported for all data available on the shales, e.g., elemental analyses of shales and oils, distribution of organic carbon in products, gas composition, and some ratios of elemental composition. Some sulfur data have been added to the assay sheets in the revised publication and appear with the stoichiometry and average values, but not with the correlation studies. The wide range of organic carbon contents made it possible to demonstrate the sensitivity of assay product distribution to oil shale grade. A linear correlation for shale grade as a function of weight percent organic carbon in raw shale is presented. An average stoichiometry for pyrolysis of the organic material is also calculated and compared with others available in the literature. 41 refs., 12 figs., 11 tabs.

15374 **Identification of organic compounds in the bitumen of Chattanooga oil shale.** McGowan, C.W.; Greenwell, B.E.; Crouse, D.J.; Markuszewski, R.; Richard, J.J.; Sepaniak, M.J. (Dept. of Chemistry, Tennessee Tech. Univ., Cookeville, TN 38505). *Preprints of Papers, American Chemical Society, Division of Fuel Chemistry;* **31**: No. 3, 294-299(1986). (CONF-8609181—).

From ACS symposium on syngas conversion catalysis advances in gasification; Santa Clara, CA, USA (7 Sep 1986).

The bitumen of Chattanooga oil shale has been extracted with benzene. The benzene-soluble material was separated into acid, base and neutral fractions with ion exchange chromatography. This separation scheme has been used extensively to separate the organic material in Green River oil shale. The acid fraction was esterified with BF/sub 3//MeOH. A large portion of the acid fraction was not esterified and this material was considered to be phenolic. The bases were separated into two fractions using alumina. The esters, the two base fractions and the total neutral fraction were analyzed using gas chromatography coupled to mass spectrometry. Two series constituting the methyl esters of normal carboxylic acids and carboxylic acids containing one double bond were identified. No homologous series were indicated in the base fraction. The base fraction was highly aliphatic. The major components in the neutral fractions were two series constituting normal and isoprenoid alkanes. A series of cycloalkanes and a series of alkenes were also indicated. The analysis scheme employed functions well for the separation and identification of aliphatic materials.

0407 Health And Safety

REFER ALSO TO CITATION(S) 15336

0409 Waste Research And Management

REFER ALSO TO CITATION(S) 15371

15375 **(DOE/FE/60177—2224) Quality of leachate from retorted oil shale wetted with treated process waters.** Clark, J.A.; Sorini, S.S. (Western Research Inst., Laramie, WY (USA)). Mar 1985. Contract FC21-83FE60177. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87002264.

Retorted oil shale samples were moistened with five different treated process waters and then leached following the American Society for Testing and Materials method D3987. Concentrations of total inorganic carbon, arsenic, boron, barium, cadmium, chromium, molybdenum, lead, antimony, selenium, strontium and vanadium were measured by inductively coupled argon plasma emission spectroscopy in both the process waters and the leachates from the moistened oil shale samples. Moistening the retorted oil shale with the treated process waters did not result in elemental adsorption by the oil shale and may have generally decreased the quality of the leachates. Long-term equilibrium studies are recommended for further evaluation of codisposal with treated process waters. 6 refs., 3 tabs.

05 NUCLEAR FUELS

REFER ALSO TO CITATION(S) 16162

0505 Uranium Enrichment

REFER ALSO TO CITATION(S) 16465

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 15857, 16067, 16331

15376 **(DP—1709) Online plutonium x-ray fluorescence analyzer system in F-Canyon.** Parry, R.F. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1986. Contract AC09-76SR00001. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005568.

An online plutonium and free-acid analyzer system was tested on the second plutonium solvent-extraction cycle product tank-sampler in F-Canyon at the Savannah River Plant. The analyzer system produced: $< 0.5\%$ (1σ precision) plutonium values in 40 minutes, and 5.0% (1σ) plutonium and free-acid results within five minutes.

15377 **(HEDL-SA—3534-FP) Interfacing robotics with plutonium fuel fabrication.** Bowen, W.W.; Moore, F.W. (Hanford Engineering Development Lab., Richland, WA (USA)). 14 Nov 1986. Contract AC06-76FF02170. 7p. (CONF-870301—18). NTIS, PC A02. File Number DE87005480.

From International topical meeting on remote systems and robotics in hostile environments; Pasco, WA, USA (29 Mar 1987).

Interfacing robotic systems with nuclear fuel fabrication processes resulted in a number of interfacing challenges. The system not only interfaces with the fuel process, but must also interface with nuclear containment, radiation control boundaries, criticality control restrictions, and numerous other safety systems required in a fuel fabrication plant. The robotic system must be designed to allow operator interface during maintenance and recovery from an upset as well as normal operations.

15378 **On the correlation between fuel structure and mechanical properties of UO/sub 2/.** Blank, H.; Mandler, R.; Matzke, H.; Routbort, J.; Werner, P. (Commission of the European Communities, Joint Research Centre, Karlsruhe Establishment, European Institute for Transuranium Elements, Postfach 2266, D-7500 Karlsruhe). pp 137-152 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

The relation between the structure of a UO/sub 2/ fuel and its mechanical properties are discussed and illustrated for particular types of UO/sub 2/ by measurements of fracture surface energy, hardness, fracture stress and compressive deformation at 1870 and 1970 K. This gives the background for treating the question whether it is possible to find a simple experimental method for correlating the mechanical properties of UO/sub 2/ before irradiation with those after various irradiation histories. Hardness measurements might be such a method if combined with a detailed structural analysis and sufficient knowledge about the irradiation history. However, for a meaningful interpretation of the data the presently available 'classical' methods of fracture mechanics are inadequate and, furthermore, sufficient additional (not yet available) information on the relations between mechanical properties and structural details are required.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 15410

15379 **(CEA-CONF—8370) CEA R and D contribution to the La Hague extension plant.** Auchapt, P.; Bonniaud, R.; Bourgeois, M.; Courouble, J.M.; Tarnero, M. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 7p. (CONF-860603—12). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750471.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

Through its subsidiary COGEMA, the CEA Group is engaged in building a very large industrial complex, designed to raise French capacity for reprocessing LWR fuels to 1600 t/year. This refers to the UP3 and UP2-800 plants currently being built at La Hague. Naturally, the well-known "Purex" process is employed in its main features, since it has proved entirely satisfactory in the UP2 facilities. Scaling up, essentially applied to capacity and aiming at a factor of 4, nevertheless requires a thorough re-assessment of all the steps in the process. Main research topics include components for bulk chopping of the fuel bundle (blades, roller, rails, ventilation, anticorrosion barriers) dissolution, liquid-liquid extraction solvent recycling, PuO_2 redissolution, liquid and solid waste treatment.

15380 **(CEA-CONF—8524) Marcoule pilot plant.** Faugeras, P.; Calame Longjean, A.; Le Bouhellec, J.; Revol, G. (CEA Etablissement de la Vallee du Rhone, 30 - Bagnols-sur-Ceze (France)). Jun 1986. 6p. (CONF-860603—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750470.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

The Marcoule spent fuel reprocessing pilot facility was built in 1960-1961 for extended testing of the PUREX process with various types of fuel under conditions similar to those encountered in a production plant. Extensive modification work was undertaken on the facility in 1983 in the scope of the TOR project, designed with the following objectives: increase the throughput capacity to at least 5 metric tons of PHENIX equivalent fuel per year; extend equipment and process R and D capability; improve job safety by maximum use of remote handling facilities; maximize waste conditioning treatments to produce waste forms suitable for direct storage; provide a true industrial process demonstration in continuous operation under centralized control using computerized procedures. The redesigned plant is scheduled to begin operation during the second half of 1986. The proximity of the Industrial Prototypes Service and the ATALANTE radiochemical research laboratory scheduled to begin operation in 1990, will provide a synergistic environment in which R and D program may be carried out under exceptional conditions.

15381 **(CNIC—00002) Recovery of /sup 238/Pu from irradiated /sup 237/Np using anion exchange method.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 13p. (In Chinese). (IAE—0002). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701272.

A process for recovering and purifying /sup 238/Pu from irradiated NpO/sub 2/ target by anion exchange method is described in detail. Related results obtained in the technological experiment for the process are given. First, absorb and desorb behaviour of /sup 237/Np-/sup 239/Pu on the anion exchange column using /sup 237/Np and /sup 239/Pu, various factors effecting /sup 237/Np//sup 239/Pu separation were investigated, then, we selected technical parameters for the four cycles process. Finally, a 'hot' experiment was conducted using an irradiated NpO/sub 2/ target. The cross-contamination of /sup 237/Np and /sup 238/Pu is less than 1%, the total recoveries of /sup 237/Np and /sup 238/Pu are respectively 99.6% and 98.1%. The total γ elimination coefficient of /sup 237/Np-/sup 238/Pu obtained in the first anion exchange cycle is 2.4 x 10/sup 3/.

15382 **(CNIC—00003) High-sensitive and quantitative in-line monitoring method for transplutonium elements separation processes.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 11p. (In Chinese). (IAE—0003). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701273.

A high-sensitive monitoring device and a quantitative analys technigue for transplutonium elements separation processes are described. X-ray and low energy γ-ray are measured by means of a scintillation monitor with two NaI(Tl) thin crystals. The α spectra of the fluents of ion-exchange column is measured by means of Si(Au) surface barrier in-line monitor. The construction of the monitors, auxiliary electronics, investigation result for the α spectra character of thick source and the calibration method were described. The determination results for extracting process of /sup 243/Am and /sup 244/Cm by ion-exchange chromatography were given. The sensitivity of total adding amount for /sup 243/Am using the 4π scintillation monitor is better than 0.1 μCi. The precision of /sup 243/Am and /sup 244/Cm concentration determination using Si(Au) monitor is +- 5%. The precision of the two metals contents in containers is about +- 10%.

15383 **(CONF-861146—14) The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor.** Burris, L.; Steunenberg, R.K.; Miller, W.E. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 36p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004746.

From AIChE winter annual meeting; Miami, FL, USA (2 Nov 1986).

An electrorefining process employing a molten salt electrolyte and a molten cadmium anode is proposed for the separation of uranium and plutonium from fission products and cladding material in discharged IFR driver fuel. The use of a liquid cadmium anode, which is the unique feature of the process, permits selective dissolution of the fuel from the cladding and prevents electrolytic corrosion of the steel container and contamination of the product by noble metal fission products.

15384 **(CONF-8610156—2) The integral fast reactor fuels reprocessing laboratory at Argonne National Laboratory, Illinois.** Wolson, R.D.; Tomczuk, Z.; Fischer, D.F.; Slawecki, M.A.; Miller, W.E. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 22p. NTIS, PC A02/MF A01. File Number DE87004859.

From Plutonium/uranium chemical recovery operations conference; Aiken, SC, USA (14 Oct 1986).

The processing of Integral Fast Reactor (IFR) metal fuel utilizes pyrochemical fuel reprocessing steps. These steps include separation of the fission products from uranium and plutonium by electrorefining in a fused salt, subsequent concentration of uranium and plutonium for reuse, removal, concentration, and packaging of the waste material. Approximately two years ago a facility became operational at Argonne National Laboratory-Illinois to establish the chemical feasibility of proposed reprocessing and consolidation processes. Sensitivity of the pyroprocessing melts to air oxidation necessitated operation in atmosphere-controlled enclosures. The Integral Fast Reactor Fuels Reprocessing Laboratory is described.

15385 **(DP—1673) Reprocessing fuel from the Southwest Experimental Fast Oxide Reactor at the Savannah River Plant.** Gray, L.W.; Campbell, T.G. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Nov 1985. Contract AC09-76SR00001. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005575.

The irradiated fuel, reject fuel tubes, and fuel fabrication scrap from the Southwest Experimental Fast Oxide Reactor (SEFOR) were transferred to the Savannah River Plant (SRP) for uranium and plutonium recovery. The unirradiated material was declad and dissolved at SRP; dissolution was accomplished in concentrated nitric acid without the addition of fluoride. The irradiated fuel was declad at Atomics International and repacked in aluminum. The fuel and aluminum cans were dissolved at SRP using nitric acid catalyzed by mercuric nitrate. As this fuel was dissolved in nongeometrically favorable tanks, boron was used as a soluble neutron poison.

15386 **(DP—1718) Hot canyon crane operating problems and equipment failures: F-Canyon Reprocessing Facility, Savannah River Plant.** Durant, W.S.; Galloway, W.D. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1986. Contract AC09-76SR00001. 132p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87005569.

A compilation of operating problems and equipment failures affecting the operability and safety of the hot canyon crane in the Savannah River Plant F-Canyon Fuel Reprocessing Facility is presented. These data have been collected over the 30-year operation of the facility. Data have been sorted by crane component or operating problem to facilitate usage. A brief description of the crane and the data bank from which the information was sorted is also included. At no time have the operating problems or equipment failures listed in this report resulted in serious injury to operating personnel. 6 refs., 1 fig., 3 tabs.

15387 **(DP-MS—86-167) Interfacing solvent extraction in the recovery of pyrochemical residues at the Savannah River Plant.** Gray, L.W.; Holcomb, H.P. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). 07 Oct 1986. Contract AC09-76SR00001. 12p. (CONF-8610226—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004187.

From 6. annual plutonium pyrochemical workshop; Los Alamos, NM, USA (7 Oct 1986).

The traditional feedstock for plutonium recovery at the Savannah River Plant (SRP) has been spent reactor fuel elements and irradiated targets. Feed sources have included both onsite reactors and a wide variety of domestic and foreign reactors. For the past few years, a growing and increasingly varied mix of unirradiated plutonium residues has been purified through SRP aqueous-based processes. Recently, plutonium residues generated in various chloride salt melts have become a significant offsite source of feed for SRP recovery operations. Impure plutonium metal and plutonium alloys have also been processed. A broader range of molten salt and other high temperature residues is anticipated for the future. The major advantage of solvent extraction for scrap purification is the versatility of the solvent extraction system which allows numerous contaminants to be removed by routine operations. Major concerns are nuclear safety control, corrosion of equipment, and control of releases to the environment. SRP's past, present, and future interfacing of solvent extraction in processing pyrochemical and other plutonium-containing residues is reviewed.

15388 **(INIS-mf—10312) Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian Ministry of State for Regional Development and Environmental Affairs.** (Institut fuer Angewandte Oekologie, Darmstadt (Germany, F.R.). Projektgruppe Reaktorsicherheit; Arbeitsgruppe Wiederaufarbeitung an der Univ. Bremen (Germany, F.R.)). 30 Jul 1985. 41p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750498.

Werkstattreihe. No. 19.

The conclusion drawn in the statement is that the expert opinions and documents available do not justify the granting of a first partial licence for the erection of the fuel reprocessing plant. Such a first partial licence would include the site approval, the outline design approval, and part-construction permits, in this case for instance for the fuel element receiving store. The site approval would be a premature decision according to this statement, as some decisive expert opinions (on meteorological, hydrological, and radioecological site conditions) are not yet completed. The documents available for evaluation of the design concept are said to have been insufficient in many regards, so that all the authors can state at the present time is that 'there may be technically feasible solutions by now'. This is judged to be an insufficient basis for an outline design approval in accordance with the Atomic Energy Act. The reasons brought forward against licensing the fuel element receiving store are similar. For lack of appropriate documents, the authors of the statement found themselves unable to assess the safety of a major component, the fuel element storage tank. (orig./HSCH).

15389 **(ORNL/TM—10256) Consolidated Fuel Reprocessing Program: Progress report for period July 1 to September 30, 1986.** Feldman, M.J.; Groenier, W.S.; Stradley, J.G.; Yarbro, O.O. (Oak Ridge National Lab., TN (USA)). Feb 1987. 29p. NTIS, PC A03/MF A01. File Number DE87005269.

Progress reports are presented in overview fashion for the following: (1) process and engineering R and D; (2) engineering systems; (3) integrated equipment test facility operations; and (4) strategic planning and analysis;

15390 **German bundle shear - cold test results.** Kunze, P. (Wiederaufarbeitungsanlage Karlsruhe, West Germany). *Transactions of the American Nuclear Society;* **53**: 118-119(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the planned Federal Republic of Germany (FRG) reprocessing plant, the mechanical decladding of the fuel elements will be done with a bundle shear. This shear was designed and built with Thyssen Henschel by adapting the experiences of the Wiederaufarbeitungsanlage Karlsruhe (WAK), the FRG reprocessing pilot plant. The tests included boiling water reactor (BWR) and pressurized water reactor (PWR) dummy elements filled with porcelain as well as steel fuel rod simulators. During the test period with prototype bundle shear, some technical improvements have been found that refer both to operating conditions and to remote handling. In 1987 the acceptance tests will be run.

15391 **Close-fitting shield doors with sculptured edges.** Goodman, L. (Fluor Engineering, Inc., ATD, Irvine, CA). *Transactions of the American Nuclear Society;* **53**: 484-485(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US Department of Energy has contracted with Fluor Technology, Inc. for design and engineering of a facility to begin reprocessing fuel from the reactors at Hanford, Washington. Within the facility, a 15-cm (6-in.)-thick, steel shield door is needed to close an opening 4.3 m (14 ft) high x 8.2 m (27 ft) wide. Two cranes and a centrally located monorail hoist must pass through the opening. The door weighs about 41,000 kg (45 ton), and passage of the hoist will be the most frequent cause for opening the door. These two factors essentially mandated a three-piece door, which allows for using commercially available chain hoists to raise and lower the individual door sections. Normally, there is a 187-Pa (0.75-in. water gauge) pressure differential across the door, and minimal air leakage is essential. Stepped, mating edges between sections and along the adjacent concrete structures are typical with such doors, but so are significant gaps (and air leaks) around the edges. Gaps are needed to preclude frictional jamming between edges as a section is lowered. The challenge was to conceive a method to produce near-zero gaps and preclude jamming without involving impractically tight tolerances. The chosen method was to place trapezoidally shaped, steel gaskets on the door-section edges and on the mating concrete surfaces. The concept is described.

15392 **Design and construction status of the fuel processing facility.** Bingham, G.E. *Transactions of the American Nuclear Society;* **53**: 157-158(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A new facility is being designed and built at the Idaho Chemical Processing Plant (ICPP) at the Idaho National Engineering Laboratory (INEL) near Idaho Falls, Idaho. The new facility, the Fuel Processing Facility (FPF), will replace existing ICPP facilities that have been in operation for almost 35 yr. The new facility will include three cycles of uranium extraction, product denitration and product storage, along with the necessary support equipment, systems, and facilities to provide a fully acceptable uranium extraction facility. The FPF design is presently ~40% complete. Site preparation and excavation are also complete. Selected long-lead procurement is in progress. Construction is scheduled to be completed in December 1992 with hot operation in December 1994.

15393 **Process facility modifications project.** Hinckley, J.P.; Alaconis, W.C. (Rockwell Hanford Operations, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 159-160(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Process Facility Modification Project (PFM) is a US Department of Energy (DOE) project which is designed to replace the existing head-end of the Plutonium Uranium Extraction (PUREX) Plant at the DOE's Hanford, Washington facilities. The purpose and need for the PFM project are twofold. First, it is desired to recover the plutonium loaned to the DOE's breeder reactor research program by the DOE's Defense Program. This plutonium is being used as fuel in the Fast Flux Test Facility (FFTF) at Hanford, Washington. The fuel consists of a mixture of PuO/UO clad in stainless steel tubes. There are presently no US facilities which can reprocess stainless-steel-clad fuel. Therefore, to recover this plutonium a new facility which uses a chop/leach process must be constructed. Secondly, it is desired to use more modern reprocessing techniques to reduce the volume of high-level liquid radioactive waste produce by PUREX. By replacing the current Zirflex headed with the chop/leach process, the amount of liquid waste generated when reprocessing N Reactor fuel can be reduced by ~90%.

15394 **Design and testing of remote handling systems for reprocessing plant maintenance and for nuclear reactor dismantling.** Baier, J.; Blaseck, K.; Krieger, F.; Kuhn, R.; Leister, P. (Noell and Co., Wuerzburg, West Germany). *Transactions of the American Nuclear Society;* **53**: 515-516(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In 1986 two important milestones will be reached in the field of remote handling technology in Germany: 1. The prototype of the manipulator carrier system with power manipulator (MTS) for the reprocessing plant in Wackersdorf will be completed and cold test operation will be started. 2. The dismantling manipulator with all special tools for the demolition of the Niederaichbach nuclear power station will be completed and cold test under mockup conditions. Both system were designed, constructed, and tested by Noell GmbH in Wuerzburg. The report describes main features of the design, the problems in fabrication and the first test results.

15395 **Remote maintenance in the TOR fast reactor fuel reprocessing facility.** Eymery, R.P.; Constant, M.; Malterre, G. (CEA, Grenoble, France). *Transactions of the American Nuclear Society;* **53**: 516-517(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The TOR facility which is undergoing commissioning tests has a capacity of 5 tonne HM/yr which is enough for reprocessing all the Phenix fuel, with an excess capacity which is to be used for other fast reactors' fuels. TOR will also be used to test new equipment developed for the large breeder fuel reprocessing plant presently in the design stage. The latter objective is specifically important for the parts of the plant involving mechanical equipment which are located in a new building: TOR 1. The basic principles in TOR 1 are the following: 1. The mechanical process operations will be automatic. 2. Test operations may be conducted on experimental units without disturbing the main process line. 3. The process equipment is built on a modular basis. 4. Removing or replacement of a module is a simple operation which can be done in a short time (<1 day). 5. Means have been provided for the circulation of technological and process wastes inside the active containment, without cask transfer. Remote handling equipment integrated maintenance methods, and maintenance tests are described.

15396 **Aspects of remote maintenance in an FRG reprocessing plant from the manufacturer's viewpoint.** Zeitzchel, G.; Tennie, M.; Saal, G. (Kraftwerk Union, Offenbach, West Germany). *Transactions of the American Nuclear Society;* **53**: 517-518(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In April 1986 a consortium led by Kraftwerk Union AG was commissioned by the German society for nuclear fuel reprocessing (DWK) to build the first West German commercial reprocessing plant for spent fuel assemblies. The main result of the planning efforts regarding remote maintenance operations inside the main process building was the introduction of FEMO technology (FEMO is an acronym based on German for remote handling modular technique). According to this technology the two cells in which the actual reprocessing (which is based on the PUREX technique) takes place are provided with frames to accommodate the process components (tanks, pumps, agitators, etc.), each frame together with the components which it supports forming one module. The two cells are inaccessible and windowless. For handling operations each cell is equipped with an overhead crane and a crane-like manipulator carrier system (MTS) with power manipulator. Viewing of the operations from outside the cells is made possible by television (TV) cameras installed at the crane, the MTS, and the manipulator. This paper addresses some examples of problems that still need to be solved in connection with FEMO handling. In particular, the need for close cooperation between the equipment operator, the component designer, the process engineer, the planning engineer, and the licensing authorities will be demonstrated.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 15386, 15489, 16446

15397 **(EGG—2491) Virginia Power and Department of Energy spent fuel transportation experience.** Ruska, M.D.; Schoonen, D.H. (EG and G Idaho, Inc., Idaho Falls (USA)). Dec 1986. Contract AC07-76ID01570. 70p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87004884.

Spent fuel assemblies for the Spent Fuel Storage Cask Testing Program conducted by EG & G Idaho, Inc., at the Idaho National Engineering Laboratory (INEL) were transported to the INEL. A total of 69 spent fuel assemblies (23 shipments) were shipped from Virginia Power's nuclear power plant at Surry, Virginia, to the INEL between July 1985 and June 1986 to fill and test three spent fuel storage casks. The shipments were made over the highway system in Transnuclear, Inc., TN-8L shipping casks on specially constructed trailers. The shipments were moved by diesel tractors owned and operated by Tri-State Motor Transit Company of Joplin, Missouri. The gross vehicle weight for each shipment was 112,000 lb, which was a major consideration when selecting routes for the shipments. Cooperative negotiations with officials for the 17 states involved obtained authorization to transport through their states. The shipping campaign was successfully completed through close communication and cooperation and careful planning and operation by all organizations involved.

15398 **(EGG-NERD—7444) Criticality safety evaluation for pathfinder fuel elements in model No. RA-3 shipping containers.** Jones, R.R. (EG and G Idaho, Inc., Idaho Falls (USA)). Nov 1986. Contract AC07-76ID01570. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004540.

Pennsylvania State University presently processes approximately 415 Pathfinder fuel elements which will require shipment from their nuclear facility. Criticality safety calculations have been performed with the Monte Carlo code, KENO-IV, and 16-group Hansen-Roach cross sections for shipment of these fuel elements in Model No. RA-3 shipping containers. Except for a slightly higher U-235 enrichment in the UO_2 rods of the Pathfinder fuel elements, the parameters for the proposed shipment are within those limits currently approved in Certificate of Compliance No. 4986, Revision No. 17, for shipment of UO_2 fuel rods in the Model RA-3 shipping containers. The analysis in this report verifies an adequate margin of criticality safety for the Pathfinder fuel elements in Model RA-3 containers for a Fissile Class 1 shipment.

15399 **(INIS-XN—47) Transport of dangerous substances by road.** (International Atomic Energy Agency, Vienna (Austria)). 1985. 191p. (In Finnish). NTIS (US Sales Only), PC A09/MF A01. File Number DE87701309.

This book is a collection of the Finnish acts and regulations concerning transport of dangerous substances by road as of 31st March 1985. Included are: Act and Decree on the Transport of Dangerous Substances by Road (No's. 510/74 and 861/74), both as amended; Decree setting up a related Commission (No. 862/74), as

amended; Act on the Contract for Carriage of Goods by Road (No. 345/79); Decree bringing into force the ADR (No. 289/79); and Decision of the Ministry of Communications on the Transport of Dangerous Substances by Road (No. 610/78) as amended by Decisions No. 344/79, 995/79, 218/82 and 935/83. (NEA).

15400 **Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C.** Einziger, R.E.; Strain, R.V. (Westinghouse Hanford Co., P.O. Box 1970, Richland, WA 99352). *Nuclear Technology;* **75**: No. 1, 82-95(Oct 1986).

Oxidation tests on spent-fuel fragments and rod segments were conducted between 250 and 360°C to relate temperature and defect size to fuel oxidation rate and time-to-cladding-splitting. Defect sizes from an equivalent circular diameter of 8 μm (the approximate size of a stress-corrosion-cracking-type breach) to 760 μm were used. Samples, held at temperature in a flowing air atmosphere, were frequently weighed and visually observed to determine the oxidation rate and effects of oxidation. Both the size and shape of the defect appear to influence the time-to-cladding-splitting. Above 283°C, time-to-cladding-splitting was longer for the sharp small defect than for the large circular defect, an effect that diminished as the temperature decreased. By 250°C the sharp small defects split open before the large circular defects, indicating that, at lower temperatures, the defect's shape and not its size may be more important when determining time-to-cladding-splitting. At both 283 and 295°C, the defects in fuel rod segments with lower burnups propagated sooner than those in rod segments with higher burnup from the same parent rod. The cumulative damage fraction approach, using a reasonable decreasing time/temperature profile, was applied to determine time-to-cladding-splitting for pressurized water reactor (PWR) fuel with a burn up >640 MWh/kg of uranium. Breached PWR fuel rod will not split open from fuel oxidation during 100 yr of storage if the rod is not exposed to air until the temperature drops below 230°C. Lower burnup fuel apparently requires lower temperature limits. The temperature limits appear to depend more on the time/temperature profile in the storage container than on oxidation rates.

15401 **Spent-fuel transportation - a success story.** Gertz, C.P.; Schoonen, D.H.; Wakeman, B.H. (DOE, Idaho, Idaho Falls). *Transactions of the American Nuclear Society;* **53**: 120(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Spent nuclear fuel research and development (R & D) demonstrations and associated transportation activities are being performed as a part of the storage cask performance testing programs at the Idaho National Engineering Laboratory (INEL). These spent-fuel programs support the Nuclear Waste Policy Act (NWPA) and US Department of Energy (DOE) objectives for cooperative demonstrations with the utilities, testing at federal sites, and alternatives for viable transportation systems. A cooperative demonstration program with the private sector to develop dry storage technologies that the US Nuclear Regulatory Commission (NRC) can generically approve is in place as well as cost-shared dry storage R & D program at a federal facility to collect the necessary licensing data. In addition to the accomplishments in the cask performance and testing demonstrations, the long-distance transportation of a large number of spent-fuel assemblies is considered a success story. The evaluation and implementation of applicable requirements, industry perspective, and extensive planning all contributed to this achievement.

15402 **Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities.** Jardine, L.J. *Transactions of the American Nuclear Society;* **53**: 120-121(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Conceptual designs are being developed in the US for facilities that receive, handle, and package spent fuel from commercial reactor sites. Current designs for the monitored retrieval storage facility or geologic repositories utilize dry spent-fuel handling methods based on adaptations of both wet spent-fuel handling and shielded hot cell technologies. This paper summarizes the results of a study that compiled from the published literature and estimated certain key characteristics of crud deposits associated with boiling water reactor and pressurized water reactor spent-fuel assemblies. The estimates can be used to determine potential releases of crud contamination and to develop associated design requirements for dry spent-fuel handling facilities. Radiation dose rates were also estimated for 10^{-2}- to 10^{-6}-cm-thick layers of crud deposited on structural and equipment surfaces. Such estimates can serve as a basis for selecting maintenance and decontamination equipment. It is recommended that further crud characterization be undertaken to support ongoing facility designs and future licensing actions. Emphasis should be placed on estimating fractional crud releases from spent-fuel assemblies for various transportation modes and handling methods.

15403 **Seismic behavior of spent-fuel racks supported by aseismic bearing devices.** Alliot, P. (Framatome-France, Courbevoie). *Transactions of the American Nuclear Society;* **53**: 122-124(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The governing loads acting on a spent-fuel rack are seismic loads due to the horizontal components of earthquake floor motion. For racks supported by pads and which are free standing on the pool floor, these loads are amplified by the dynamic response of the rack structure. With the use of neutron-absorbing material leading to higher density storage of assemblies, there is a need to design a base isolation that would support the racks and uncouple them from the horizontal floor accelerations. Framatome has designed and qualified a base isolation system consisting of two orthogonal layers of rollers, which can accommodate both horizontal ground motions of an earthquake. This paper presents the following various tests and calculations performed in order to qualify the aseismic bearing devices: 1) one-quarter-scale test on a shake table in order to show the magnitude of the reduction of horizontal acceleration; 2) test on a scale 1 spent-fuel module in a test pool in order to evaluate the fuel rack motion damping and qualify the method used to calculate the hydrodynamic coupling masses between fuel rack and pool; and 3) nonlinear time history calculation of the fuel rack displacement during an earthquake.

15404 **Automated nuclear storage facility.** Erkkila, B.H. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 156-157(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this paper is to describe the plans and design of a medium- to long-term storage facility for source materials, special, and other nuclear materials. This project was identified by the Los Alamos National Laboratory (LANL) Long Range Planning Group as the key project in establishing a future growth policy for LANL's Special Nuclear Materials (SNM) Park. Several unique features of this facility are discussed in detail. The nuclear material storage facility will be a much needed addition to the nuclear materials complex at LANL. Construction has begun and an anticipated completion data of August 1987 is very possible. Full operation of the facility should begin by early 1988.

0510 Marketing, Economics, And By-products

REFER ALSO TO CITATION(S) 15869

15405 (IAEA-TECDOC—378, pp 75-84) **Possible short and long term evolution in the cost of PWRs nuclear fuel and coal.** Baumier, J. (CEA, 75 - Paris, France. Dept. des Programmes). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Cost evolution is a problem which keeps coming up whenever there is discussion about an energy policy. This paper identifies the causes of the charges of the past in order to give a better understanding of the costs of nuclear fuels and examines the reliability of the present forecasts. For this purpose the French case is used as an example. The conclusion is as follows: The cost of the nuclear fuel cycle should remain at about 6 centimes/kWh in con-

stant francs as they were on 1.1.84, if the price of uranium does not increase by more than 2% per annum, since an increase in this item is more than balanced by the anticipated fall in the enrichment and reprocessing costs after amortization of the relevant plants. In fact, the main parameter is the price of coal. If it remains constant, the competitiveness of nuclear fuel will not decline but will, on the contrary, increase appreciably, even given a moderate rise in coal price. 2 refs, 3 figs, 6 tabs.

15406 (IAEA-TECDOC—378, pp 85-102) **Nuclear investment and fuel cycle costs. Short and long term evolution of uranium costs. Canadian perspective.** Sligl, V.R. (Energy, Mines and Resources Canada, Ottawa, Ontario. Uranium and Nuclear Energy Branch). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This paper is a schematic description of the following: 1) Nuclear power in developing countries; 2) The world-wide nuclear situation; 3) The developing countries nuclear situation; 4) The situation in selected countries; 5) Future prospects; 6) Basic approach for developing countries; 7) Results of the NEA nuclear fuel economics study; 8) The uranium production situation; 9) The uranium price fluctuation. In addition hereto the paper contains an appendix concerning the Canadian nuclear status and experience. Tabs and figs.

0520 Waste Management

REFER ALSO TO CITATION(S) 15487, 15488, 15538, 15539, 15540, 15541, 15560, 15561, 15562, 15852, 16066, 16160, 16237, 16263, 16275, 16350, 16356, 16358, 16406, 16458, 16918, 16919, 16920, 16921, 16924, 16925, 17654

15407 (BMI/ONWI—629) **Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report.** (NUS Corp., Gaithersburg, MD (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Jan 1987. 63p. NTIS, PC A04/MF A01. File Number DE87005194.

This report describes and qualitatively evaluates eight options for managing the large volumes of salt and salt-laden rock that would result from the excavation of a high-level radioactive waste repository in Deaf Smith County or Swisher County, Texas. The options are: distribution for commercial use; ocean disposal; deep-well injection; disposal in multilevel mines on the site; disposal in abandoned salt mines off the site; disposal off the site in abandoned mines developed for minerals other than salt; disposal in excavated landfills; and surface disposal on alkali flats. The main features of each option are described, as well as the associated environmental and economic impacts, and regulatory constraints. The options are evaluated in terms of 11 factors that jointly constitute a test of relative suitability. The results of the evaluation and implications for further study are indicated. This document does not consider or include the actual numbers, findings, or conclusions contained in the final Deaf Smith County Environmental Assessment (DOE, 1986). 43 refs., 8 tabs.

15408 (BNL-NUREG—39007) **Release of organic chelating agents from solidified decontamination wastes.** Piciulo, P.L.; Adams, J.W.; Milian, L.W. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1986. Contract AC02-76CH00016. 11p. (CONF-860905—28). NTIS, PC A02/MF A01. File Number TI87004171.

From International meeting on low, intermediate and high level waste management - decontamination and decommissioning; Niagara Falls, NY, USA (14 Sep 1986).

In order to provide technical information needed by the US Nuclear Regulatory Commission to evaluate the adequacy of near-surface disposal of decontamination wastes, Brookhaven National Laboratory has measured the release of organic complexing agents from simulated decontamination resin wastes solidified in cement and vinyl ester-styrene. The simulated waste consisted of either mixed bed ion-exchange resins or anion exchange resins equilibrated with EDTA, oxalic acid, citric acid, picolinic acid, formic acid, simulated LOMI reagent or the LND-101A decontamination reagent. The standard procedure ANS 16.1 appeared to be adequate for determining a leachability index for organic acids for comparing the leach resistance of decontamination waste forms. Leachability indexes appeared to be specific for each organic acid. Further, the apparent diffusivities were generally less than those observed for Cs releases from cement wastes forms. The finder material and the composition of the simulated wastes affected the release of the reagents.

15409 (CEA-CONF—8406) **Test unit for measurement of small masses of alpha wastes.** Praca, C.; Labarre, S.; Ainardi, A.; Schneider, M.; Moussin, C. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Mar 1986. 18p. (In French). (CONF-8603159—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750440.

From Meeting on protection, handling, detection and safety; Grenoble, France (12 Mar 1986).

New standards for waste surface storage require permanent management of fissile materials, even minute amounts, and accurate measurement of waste production. An accurate original system using gamma spectrometry is described in this article. It includes a lead shielded cell, a INa collimated sensor with direct counting including the peaks of Pu 239 and Pu 241 in the 400 keV range and data processing and recording. For a light matrix (cellulose or vinyl) sensitivity is 20 mg and accuracy +-25% and for a heavy matrix (graphite) 30 mg +-40%.

15410 (CEA-CONF—8487) **Tritium management in PWR fuel reprocessing plants.** Goumondy, J.P. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Apr 1986. 21p. (In French). (CONF-8604266—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750556.

From Tritium meeting; Dijon, France (23 Apr 1986).

Activity, quantity and nature of tritium compounds obtained during head end process (cutting and dissolution) are determined to estimate environmental release hazards in fuel reprocessing plants. Measurements on representative PWR reactor fuels (burnup 33,000 $MWdt^{-1}$, specific power 30 MW dt^{-1}) show that about 60% of the tritium produced in the reactor diffuses in the cladding where it is fixed. Remaining tritium stays in the irradiated oxide and is found as tritiated water in the solution obtained during fuel dissolution. In the UP3 plant at La Hague (France) tritiated water is disposed into the sea without environmental problems. In the case of a reprocessing plant far from the sea, the PUREX process is slightly modified for concentration of tritium in a limited amount of water (TRILEX process). It is verified experimentally in $\alpha\beta\gamma$ lab on actual fuel and by simulation at the pilot seale that the supplementary step "tritium washing" of the solvent can be obtained in pulsed columns. 4 tables, 7 figs.

15411 (CEA-CONF—8506) **Low and medium level liquid waste processing at the new La Hague reprocessing plant.** Alexandre, D. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). May 1986. 19p. (In French). (CONF-8605205—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750558.

From Colloquium on hydrology and radiology; Limoges, France (21 May 1986).

Reprocessing of spent nuclear fuels produces low- and medium-activity liquid wastes. These radioactive wastes are decontamined before release in environment. The new effluent processing plant, which is being built at La Hague, is briefly described. Radionuclides are removed from liquid wastes by coprecipitation. The effluent is released after decantation and filtration. Insoluble sludges are conditioned in bitumen.

15412 **(CNEN-NE—6.05) Radioactive waste management in radioactive installations.** (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro). Nov 1985. 60p. (In Portuguese). Centro de Informacoes Nucleares, Comissao Nacional de Energia Nuclear, RJ, Brazil.

It is presented a norm to establish general criteria and basic requirements related to radioactive waste management. The norm is applied to radioactive installations subject to licensing process by Brazilian Nuclear Energy Commission-CNEN.

15413 **(CONF-861207—47) The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment.** Ebert, W.L.; Bates, J.K.; Gerding, T.J.; Van Konynenburg, R.A. (Argonne National Lab., IL (USA); Lawrence Livermore National Lab., CA (USA)). Dec 1986. Contract W-31109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004872.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

The Nevada Nuclear Waste Storage Investigations project has completed a series of experiments that provide insight into groundwater chemistry and glass waste form performance in the presence of a gamma radiation field at 90°C. Results from experiments done at 1 x 10^3 and O R/hr are presented and compared to similar experiments done at 2 x 10^5 and 1 x 10^4 R/hr. The major effect of radiation is to lower the groundwater pH to a value near 6.4. The addition of glass to the system results in slightly more basic final pH, both in the presence and absence of radiation. However, there is essentially no difference in the extent of glass reaction, as measured by elemental release, as a function of dose rate or total dose, for reaction periods up to 278 days.

15414 **(CONF-870306—5) Quality assurance consideration for cement-based grout technology programs at Oak Ridge National Laboratory.** McDaniel, E.W.; Tallent, O.K.; Sams, T.L.; Delzer, D.B. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004620.

From Waste management '87; Tucson, AZ, USA (1 Mar 1987).

Oak Ridge National Laboratory has developed and is continuing to refine a method of immobilizing low-level radioactive liquid wastes by mixing them with cementitious dry-solid blends. A quality assurance program is vital to the project because Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA) and state environmental regulations must be demonstrably met (the work must be defensible in a court of law). The end result of quality assurance (QA) is, by definition, a product of demonstrable quality. In the laboratory, this entails traceability, repeatability, and credibility. This paper describes the application of QA in grout technology development at Oak Ridge National Laboratory.

15415 **(CONF-870306—6) Cleanup operations at the Oak Ridge Gaseous Diffusion Plant contaminated metal scrapyard.** Williams, L.C. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02. File Number DE87005330.

From Waste management '87; Tucson, AZ, USA (1 Mar 1987).

Cleanup operations at the contaminated metal storage yard located at the Oak Ridge, Tennessee, Gaseous Diffusion Plant have been completed. The storage yard, in existence since the early 1970s, contained an estimated 35,000 tons of mixed-type metals spread over an area of roughly 30 acres. The overall cleanup program required removing the metal from the storage yard, sorting by specific metal types, and size reduction of specific types for future processing. This paper explains the methods and procedures used to accomplish this task.

15416 **(CONF-870306—7) How well does ORIGEN predict spent LWR [Light Water Reactor] fuel characteristics.** Mailen, J.C.; Roddy, J.W. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005338.

From Waste management '87; Tucson, AZ, USA (1 Mar 1987).

The ORIGEN computer code is widely used to estimate the radionuclide content (actinides, activation and fission products) of irradiated reactor fuel and the resultant heat generation and radiation levels associated with such fuel. These estimates are used as source terms in safety evaluations of operating reactors, for evaluation of fuel behavior and regulation of the at-reactor storage, for transportation studies, and for evaluation of the ultimate geologic storage of the fuel. Calculated values determined using several variations of ORIGEN have been compared with experimentally determined values for actual fuel for many, but not all, of the parameters desired. In most cases, the comparisons did not use the most recent ORIGEN2 program, the most recent data libraries, or currently required quality assurance (QA) procedures. Comparisons of fuel composition data with ORIGEN2 are very limited, and the only data with proper QA are currently being acquired by Battelle Pacific Northwest Laboratory. This survey summarizes the fuel data available in the open literature and, where given, the calculated values by ORIGEN. Plans for additional analyses of well-characterized reactor fuel samples to improve the validation of ORIGEN2 are discussed.

15417 **(CONF-870306—8) The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics.** Klein, J.A. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02. File Number DE87005341.

From Waste management '87; Tucson, AZ, USA (1 Mar 1987).

The Integrated Data Base (IDB) is the official US Department of Energy (DOE) data base for spent fuel and radioactive waste inventories and projections. As such, it should be as convenient to utilize as is practical. Examples of summary-level tables and figures are presented, as well as more-detailed graphics describing waste-form distribution by site and line charts illustrating historical and projected volume (or mass) changes. This information is readily accessible through the annual IDB publication. Other presentation formats are also available to the DOE community through a simple request to the IDB Program.

15418 **(CONF-870306—11) Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft.** Williams, R.E.; McGrath, D.A.; Boland, J.R. (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA); USDOE Nevada Operations Office, Las Vegas). 1987. Contract AC08-84NV10327. 5p. NTIS, PC A02. File Number DE87005384.

From Waste management '87; Tucson, AZ, USA (1 Mar 1987).

Soil temperature and moisture data have been collected for the past 4 years at the Greater Confinement Disposal Test (GCDT) being conducted at the Nevada Test Site. High-specific-activity radioactive waste with a thermal output of 3.4 kW was buried at a depth of 30 m in tuffaceous alluvium. Prior to waste emplacement the ambient subsurface temperature was about 17°C and the volumetric soil moisture content was 10 to 12%. Two years after waste emplacement the soil temperature exceeded 100°C and the soil moisture content dropped below 4% at a radius of approximately 3 m from the thermal waste. Drying of the soil has occurred as the high temperature radiating from the thermal sources propels water vapor from the waste zone to a zone where dew-point temperatures are reached. The temperature and moisture data will be used in combination with data from gaseous tracer release tests in predicting and appraising the long-term performance of the GCDT.

15419 **(DOE/CH/10272—1) Draft area recommendation report for the Crystalline Repository Project: Comments: Final technical report.** (Mille Lacs Band of Chippewa Indians, Onamia, MN (USA)). 16 Apr 1986. Contract FG02-86CH10272. 42p. NTIS, PC A03. File Number DE87004645.

The Mille Lacs Band conducted a review of the draft area recommendation report (ARR) and provided comments as outlined in the contract. It also had staff attending the necessary training and informational meeting established by the Department of

Energy. This had met all the necessary objectives as outlined in the contract.

15420 (DOE/CH/10276—1) Crystalline Repository Project: Review and comment of the Leech Lake Reservation Business Committee: Draft area recommendation report. (Leech Lake Reservation Business Committee, Cass Lake, MN (USA)). Sep 1986. Contract FG02-86CH10276. 13p. NTIS, PC A02. File Number DE87004324.

The Leech Lake Reservation Business Committee (LLRBC) has reviewed five documents related to the US Department of Energy's Crystalline Repository Project (CRP). They are the "National Survey of Crystalline Rocks," "General Guidelines for the Recommendation of Sites for the Nuclear Waste Repositories;' Final Siting Guidelines (10 CFR Part 960)," "Regional Characterization Reports for the North Central Region," the "Region to Area Screening Methodology Document" (SMD) and the "Draft Area Recommendation Report" (DARR). The comments and discussions of issues contained in this review will be considered in the preparation of the Final Area Recommendation Report, which will formally identify potentially acceptable sites for a second national repository for the permanent disposal of high level nuclear waste. Following a review of the above referenced documents, the LLRBC has concluded that the identification of potentially acceptable sites in the Draft Area Recommendation Report is based upon inferior and incomplete technical information being applied to a flawed screening process which, among other deficiencies, pays little attention to the importance of hydrological factors in the siting process. Although the DOE prefers that comments from states and tribes be directed at the Draft Area Recommendation Report alone, the Leech Lake Reservation Business Committee is extremely concerned about inadequacies in the "National Survey of Crystalline Rocks" (ORCD-1), which serves as the foundation for all siting work done to date. The national survey was conducted utilizing little of the time or staffing required for this important phase of the Crystalline Repository Program. As a result, the national survey is based upon out-of-date scientific literature, exaggerates certain screening variables that favor the selection of regions in the eastern US and arbitrarily eliminated the few western crystalline rock bodies that passed the questionable screening process utilized.

15421 (DOE/CH/10282—1) Technical review of US Department of Energy draft area recommendation report for the crystalline repository project. (Foth and Van Dyke and Associates, Inc., Green Bay, WI (USA). Waste/Energy Div.). Apr 1986. Contract FG02-86CH10282. 86p. NTIS, PC A05. File Number DE87004325.

Foth and Van Dyke and Associates Inc. was retained by the Stockbridge-Munsee Community to evaluate the DOE's screening process for selection of candidate areas in crystalline rock terranes, and critically review the geologic and environmental factors utilized by the DOE in selecting the NC-3 area as a potentially acceptable site (PAS). We have reviewed the DOE's Draft Area Recommendation Report (ARR) issued in January 1986, and prepared our comments. In addition, geologic and environmental data pertaining to the Stockbridge-Munsee community and vicinity that was not included in the Draft ARR is presented. 24 refs., 7 figs., 4 tabs.

15422 (DOE/ID/12514—T1) Site characterization field manual for near surface geologic disposal of low-level radioactive waste. McCray, J.G.; Nowatzki, E.A. (Arizona Univ., Tucson (USA)). 31 Dec 1985. Contract FG07-84ID12514. 336p. NTIS, PC A15/MF A01; 1; GPO Dep. File Number DE87005349.

This field manual has been developed to aid states and regions to do a detailed characterization of a proposed near-surface low-level waste disposal site. The field manual is directed at planners, staff personnel and experts in one discipline to acquaint them with the requirements of other disciplines involved in site characterization. While it can provide a good review, it is not designed to tell experts how to do their job within their own discipline.

15423 (DOE/OR/00033—T251) Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Radioactive waste management fellowship, 1985-1986. (Oak Ridge Associated Universities, Inc., TN (USA)). 1986. Contract AC05-76OR00033. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004590.

This report summarizes the 1985-86 activities of the radioactive waste management element of the US Department of Energy (DOE) Nuclear Engineering, Health Physics, and Radioactive Waste Management Fellowship program. Throughout the past year the fellowship program continued to assist DOE in meeting its expected manpower demands for trained scientists and engineers needed for the implementation of the 1982 Nuclear Waste Policy Act. A general shortage of master's and doctoral level scientists and engineers in disciplines supportive of the nation's high-level radioactive waste management may impede the Department of Energy's ability to properly carry out its mission in these areas. In addition, the underutilization of related graduate programs may have a long-term detrimental effect on this mission. The fellowship program is designed to send a signal of support for graduate programs with research and curriculum related to the management of high-level waste (HLW). It is expected that this support will encourage talented graduate students to enter the HLW graduate programs and the universities will be motivated to support and improve on their existing programs.

15424 (DOE/OR/00033—T254) Historically Black Colleges and Universities Radioactive Waste Management Research Program: Summary of activities, 1985-1986. (Oak Ridge Associated Universities, Inc., TN (USA)). 1986. Contract AC05-76OR00033. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004878.

This report summarizes the 1985 to 1986 activities of the Historically Black Colleges and Universities (HBCUs) Radioactive Waste Management Research Program sponsored by the Office of Civilian Radioactive Waste Management of the US Department of Energy (DOE). The first set of three awards was made in September,1984. In September, 1985, two of these projects were renewed and a new proposal was funded. The program has been enthusiastically received by the community of HBCUs and the program sponsor.

15425 (DPST—85-547) Off-gas chemistry study of melter feed by Springborn Laboratories. Crow, K.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 5 Jun 1985. Contract AC09-76SR00001. 133p. NTIS, PC A07. File Number DE87004516.

The purpose of the off-gas chemistry study of melter feed samples was to support and help substantiate glass melter thermochemistry models developed for the DWPF. Both sludge-only and sludge-precipitate feed samples were analyzed. Each slurry sample was pyrolyzed at temperatures from 150 to 1000°C in air and inert atmospheres, and the head space products were analyzed by chromatographic and mass spectrometric methods. Thermogravimetric, differential scanning calorimetric and Fourier transform infrared analyses were also performed on each sample. There were no unusually high exothermic reactions that would be cause for concern in the DWPF melter. Results for two types of sludge-precipitate feed were compared. One type contained simulated precipitate hydrolysis aqueous (PHA) product as fed to the SCM-2 melter. The second type contained PHA from the lab-scale acid hydrolysis reactor in 677-T. A major difference between the two types was a small, but distinct, presence of higher aromatics in gas from feed with reactor-produced PHA. This feed also evolved more CO and CO_2 than feed with simulated PHA at high pyrolytic temperatures (>750°C). Recent analyses have identified the higher boiling aromatics in reactor-produced PHA as primarily diphenylamine and p-terphenyl. These compounds will be included in future PHA simulations that are fed to research melters. Under an inert atmosphere, benzene and phenol were the two most abundant organics evolved during pyrolysis of sludge-precipitate feed.

15426 **(EUR—10293) Processing of miscellaneous radioactive effluents by continuous flocculation decantation.** Lundy, D.; Matton, P.; Petteau, J.L.; Roofthooft, R. (Commission of the European Communities, Luxembourg). 1985. 154p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE87750553.

In the nuclear power plant of Chooz an installation for flocculation and chemical precipitation has been built to treat miscellaneous radioactive effluents continuously. It is an industrial prototype of 5 m^3/h resulting of several years of research, first on lab scale in a discontinuous system and finally in a continuous pilot plant of small size (500 l/h). The process is based on the adsorption of radioactivity on a floc of copper-ferrocyanide precipitated by ferric chloride. The water is then filtered. After a series of preliminary tests and modifications, it has been possible to develop a technique which satisfies the specified decontamination conditions and to reduce the discharges of radioactivity to the Meuse to only 5 - 10% of the authorized limits. The process aims principally at the treatment of laundry waste, but other effluents such as drains from the rocks, pool water and used decontamination solutions (of the primary pumps) have been treated. A technico-economic evaluation of the process in comparison with evaporation is clearly in favour of the flocculation. 31 figs, 40 tables, 12 refs.

15427 **(EUR—10382) Decontamination of some liquid wastes of medium activity with a new solvent type.** Gasparini, G. (Commission of the European Communities, Luxembourg). 1986. 171p. (In Italian). NTIS (US Sales Only), PC A08/MF A01. File Number DE87750545.

The decontamination of a reference MAWsub(s) (an alkaline solution coming from the solvent washing and an acidic solution consisting of the mixture of aqueous raffinates deriving from uranium and plutonium purification cycles) by hydroxamic acid is reported. The results of the "in batch" decontamination tests, using extraction chromatography techniques, are given. The extraction chromatography techniques do not give the expected performances for the tests in column. Discontinuous liquid extraction tests using traced solutions show that Pu, Am, Zr, Nb are extracted but not U and Ru. The strip of Pu, Am and Zr with an oxalic acid solution is quantitative. Continuous tests using mixer settler batteries, and a simulated alkaline solution and complete extraction-reextraction runs using a simulated solution are conducted. The results of a discontinuous conclusive experiments using a true alkaline solution coming from a reprocessing plant are given.

15428 **(EUR—10411) High-temperature incineration of radioactive waste. Exploitation of the FLK-60 slagging incinerator for the treatment of different waste streams contaminated with plutonium.** Voorde Van de, N.; Taeymans, A.; Hennart, D.; Vanbrabant, R.; Balleux, W.; Geenen, G.; Gijbels, J. (Commission of the European Communities, Luxembourg). 1986. 70p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87750546.

During the years 1983 and 1984 the FLK-60 high-temperature slagging incinerator at Mol was used for incineration of simulated plutonium waste and BWR power-station waste after extensive technical adaptations. A total of 10 tons of simulated waste containing 15 g of plutonium and 6 tons of simulated waste containing 624 MBq of ^{60}Co and 393 MBq of cesium isotopes was successfully treated. The average volume reduction factor was 18. Global decontamination factors of 280,000 for ^{137}Cs and 22,000,000 for ^{239}Pu were measured. Routine working and interventions for maintenance and repair could be carried out safely in alpha-conditions. The report describes in detail the technical adaptations and the behaviour of the various parts of the installation during the 39 runs carried out in the contract period. It also gives the chemical and radiochemical composition of the granules and secondary waste streams. The plutonium-based leach rate of the granules is in the range of 2×10^{-5} to 3.5×10^{-4} g/cm^2. d. Finally typical mass, energy and radioactivity balances of the installation are given and various options for the final conditioning of the granules are briefly discussed. 6 refs, 6 figs, 29 tables.

15429 **(EUR—10491) Experimental study of the recovery of plutonium from non-combustible wastes.** Chamberlain, H.E.; Dalton, J.T.; Dawson, R.K.; Gaudie, S.C.; Turner, A.D.; Wilkins, J.D. (Commission of the European Communities, Luxembourg). 1986. 128p. NTIS (US Sales Only), PC A07/MF A01. File Number DE87750555.

Removal of loose PuO_2 from non-combustible plutonium contaminated waste by Arklone (1,1,2-trichloro,1,2,2-trifluoro ethane) has been demonstrated on a laboratory scale. While aqueous-containing media are generally more effective decontaminants, Arklone has the advantages of being non-moderating and easily recycled by distillation. Although low-pressure spraying and vibrocleaning are effective contacting methods, ultrasonics gave the highest DF's- reducing residual Pu levels to 1-10 $\mu g/cm^2$. Lower levels are unattainable in a simple batch process due to redeposition of particulates in small surface flaws. More agressive processes are needed to achieve further decontamination. Microscopic smoothness has been identified as the most significant parameter in determining PuO_2 retention and subsequent ease of decontamination. To maintain this, radiation resitance is important, as also is surface hardness under abrasive conditions. For facility walls and ceilings, therefore, electropolished stainless steel, 316L or PEEK foil-faced GRP, and epoxy paint (with fine TiO_2) are recommended to reduce residual PuO_2 to <1 $\mu g/cm^2$ after ultrasonic washing, while work-hardened polish rolled stainless steel and bright nickel or chrome electroplates are suggested to achieve similar levels on the floor. 10 tables, 50 figs, 6 refs.

15430 **(NTB—85-01) Exploratory borehole Boettstein: Investigation report. Text volume.** Thury, M. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jun 1985. 190p. (In German). Nagra, Ch-5401 Baden, Switzerland.

Nagra, the National Cooperative for the Storage of Radioactive Waste, is carrying out a comprehensive geological research programme in northern Switzerland. This study, begun in 1980, will provide the scientific knowledge required to judge the suitability of the subsurface bedrock for the final storage of nuclear waste. The Boettstein well was the first borehole on the drilling programme. Its total depth is 1501 m. The present report is an extensive synopsis of the most important results achieved. It also contains comments on the methodology applied. The detailed reporting on the individual investigations is contained in the technical reports of Nagra. At present, 10 reports dealing with the Boettstein well have been published in this series, and further reports are in preparation.

15431 **(NTB—85-12) Exploratory borehole Boettstein: Construction and environmental aspects, drilling techniques.** (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Feb 1985. 128p. (In German). Nagra, Ch-5401 Baden, Switzerland.

The exploration well at Boettstein was realized as the first well within the Nagra Deep Drilling Program in Northern Switzerland. The drilling work was started October 11, 1982. Having reached the final depth of 1501.3 m on June 5, 1983, the test phase was initiated and completed by January 26, 1984. The well drilled approx. 315 m of sediments and approx. 1285 m of crystalline rock. Oriented cores were taken nearly over the whole length of the well. The present report presents the drilling activities, civil construction work related to the site and precautions taken to account for environmental protection aspects. A chapter dealing with the commission representing members of the federal, cantonal and local authorities and about reporting is given at the end of this report.

15432 **(NTB—85-24) Shrinkage experiments on bentonite samples.** Bucher, F.; Jedelhauser, P.; Jeger, P. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jan 1985. 18p. (In German). Nagra, Ch-5401 Baden, Switzerland.

Like other cohesive soils, bentonite exhibit shrinkage effects, i.e. when a wet sample is dried out the sample volume decreases even below the saturation limit; this can lead to crack and therefore to a decrease in heattransport through the material. The shrinkage of samples of the bentonites MX-80 and Montigel identified by Nagra as potential backfill materials has been investigated. For this

purpose the amount of shrinkage has been determined on uniaxially and isostatically compacted samples under conditions close to those expected in a repository as well as on samples initially at the liquid limit. The shrinkage limit is at a water of about 14%, resp. 18%, the shrinkage s/sup '/ expressed as a fraction of total sample volume amounts to about 9% for MX-80 and to 11% for Montigel Pulver, as determined for samples initially at the liquid limit. The shrinkage s/sup '/ of the compacted samples with water content w when shrinkage begins between 6% and 12% and corresponding dry density rho/sub d/ between 1.5 Mg/m/sup 3/ and 2.0 Mg/m/sup 3/ follows the equation s/sup '/ = s w rho/sub d/ / rho/sub w/ where the value of s, as determined experimentally, is s = (36 +- 4)%.

15433 **(NTB—85-25) Long-term stability of bentonite under repository conditions.** Mueller-Vonmoos, M.; Kahr, G. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Mar 1985. 41p. (In German). Nagra, Ch-5401 Baden, Switzerland.

In order to assess the long-term stability of bentonite under repository conditions, five metabentonite samples from Kinnekulle (Sweden) and one sample of illite from the Massif Central (France) have been studied. It could be shown that the layer surface charge of montmorillonite increased only by a relatively small amount in the course of the transformation into metabentonite; furthermore the final product was not illite, but smectite/illite mixedlayers. The potassium content of the sample expressed as a fraction of the total ion exchange capacity decreased from 72% at the edge of the 180 cm wide bed of metabentonite to 54% in the centre, i.e. potassium had not fully exchanged aven after 450 million years. From the cation exchange capacity of the mixed layers and from the X-ray and thermoanalytical investigations by means of mass spectrometry, it can be concluded that the proportion of closed layers increases on going from the centre to the edge of the bed, particularly in the outer 10 cm. The innercrystalline swelling capability was essentially maintained, as shown by tests on a sample consisting of a mixture of all samples investigated. It may be assumed that the influence of temperature will be less in the repository than during the formation of the Kinnekulle bed. Conservative calculations show that the transformation of the bentonite into the potassium form will take more than 10/sup 6/ years. The results of the investigations carried out show that this transformation will probably be considerably slower.

15434 **(NTB—85-29) Hydrogeological basis for the modelling area Oberbauenstock.** Resele, G.; Tripet, J.P. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Apr 1985. 70p. (In German). Nagra, Ch-5401 Baden, Switzerland.

For the project 'Gewaehr 1985', the data concerning the hydraulic parameters of the host rock (valanginian marls) in the modelling area of Oberbauenstock have been reviewed and processed; the hydraulic conductivities, in particular, have been estimated. The corresponding results are shown in the present report. According to the field observations, the 'compact' rock ('rock matrix') is practically impervious and the deep ground water flows in a network of interconnected discontinuities. The valanginian marls show three joint systems of significance for ground water flow. The geometry of these systems is defined in the present report: in particular, it is shown that the joints are closely interconnected. The hydraulic conductivity of the discontinuities is estimated to be K/sub F/ = 3.10/sup -9/ m/s, the large-scale host rock conductivity K/sub 0/ = 10/sup -1/0 m/s, with an anisotropy significantly below 10 : 1. In the vicinity of the existing or possible underground structures as tunnels and caverns, a decompressed zone is produced, whose significance for the hydraulic parameters of the host rock is shown. Observations made on the water inflow from the valanginian marls into the Seelisberg Tunnel have been processed and the seepage rate found to be very limited. The local manifestations of humidity or of drips are well correlated with certain elements of the geological structure and in particular with the thickness of the valanginian marls above the tunnel.

15435 **(NUREG—1199) Standard format and content of a license application for a low-level radioactive waste disposal facility: Safety analysis report.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards). Jan 1987. 106p. NTIS, PC A06/MF A01 - GPO. File Number TI87900510.

This document discusses the information that should be provided in the Safety Analysis Report and establishes a uniform format for presenting the information necessary to fulfill the licensing requirements for land disposal of radioactive waste called for in 10 CFR 61. The uniform format will (1) help ensure that the Safety Analysis Report contains the information required by 10 CFR 61, (2) aid the applicant and NRC staff in ensuring that the information is complete, (3) help persons reading the Safety Analysis Report to locate information, and (4) contribute to shortening the time needed for the review process.

15436 **(NUREG—1200) Standard review plan for the review of a license application for a low-level radioactive waste disposal facility: Safety analysis report.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards). Jan 1987. 468p. NTIS, PC A20/MF A01 - GPO. File Number TI87900511.

The Standard Review Plan (SRP) (NUREG-1200) provides guidance to staff reviewers in the Office of Nuclear Material Safety and Safeguards who perform safety reviews of applications to construct and operate low-level radioactive waste disposal facilities. The SRP ensures the quality and uniformity of the staff reviews and presents a well-defined base from which to evaluate proposed changes in the scope and requirements of the staff reviews. The SRP makes information about the regulatory licensing process widely available and serves to improve the understanding of the staff's review process by interested members of the public and the nuclear power industry. Each individual SRP addresses the responsibilities of persons performing the review, the matters that are reviewed, the Commission's regulations and acceptance criteria necessary for the review, how the review is accomplished, the conclusions that are appropriate, and the implementation requirements.

15437 (NUREG/CP—0079, pp 131-184) **Fluid flow in a fractured rock mass.** Klavetter, E.A.; Peters, R.R. (Sandia National Labs., Albuquerque, NM). Aug 1986. NTIS, PC A25/MF A01 - GPO. File Number TI87002232. (PNL-SA—13796; CONF-8505180—). Contract AC04-76DP00789.

From Symposium on groundwater flow and transport modeling for performance assessment of deep geologic disposal of radioactive waste; Albuquerque, NM, USA (20 May 1985).

The geological formations in the unsaturated zone underlying Yucca Mountain, on and adjacent to the Nevada Test Site, are being evaluated by the Nevada Nuclear Waste Storage Investigations project. The formations are being considered as host media for a radioactive-waste repository. They are composed of tuffaceous materials, sometimes highly fractured, whose hydrologic properties must be evaluated to estimate the rate at which radionuclides could migrate to the accessible environment. Hydrologic flow models used for postclosure performance assessment of the prospective repository must take into account the potential for water movement in both the rock matrix and the fractures. Calculations using models that explicitly account for the effects of individual fractures are not feasible, because of the extremely large number of fractures contained in a site-scale problem and the difficulties in characterizing and modeling the fracture geometries. Comparisons of properties calculated by both approaches were found to yield qualitatively and quantitatively similar results.

15438 (NUREG/CP—0079, pp 188-229) **Effect of percolation rate on water-travel time in deep, partially saturated zones.** Peters, R.R.; Gauthier, J.H.; Dudley, A.L. (Sandia National Labs., Albuquerque, NM). Aug 1986. NTIS, PC A25/MF A01 - GPO. File Number TI87002232. (PNL-SA—13796; CONF-8505180—). Contract AC04-76DP00789.

From Symposium on groundwater flow and transport modeling for performance assessment of deep geologic disposal of radioactive waste; Albuquerque, NM, USA (20 May 1985).

The Nevada Nuclear Waste Storage Investigations (NNWSI) project is investigating Yucca Mountain, Nye County, Nevada, as a prospective site for a radioactive-waste repository. The Yucca Mountain site is unique among those currently being investigated by the US Department of Energy (DOE) in that the prospective repository location is in the unsaturated zone, approximately 300 m above the water table. A composite-porosity, continuum model was developed to model flow in a fractured, porous medium. Simulations using data from the Yucca Mountain site and this model in the one-dimensional code TOSPAC indicate that current estimates of the percolation rate result in water movement confined to the matrix and that the water-travel time from the repository to the water table in on the order of hundreds of thousands of years. This result is sensitive to the percolation rate; an increase in percolation rate of a factor of 10 may initiate water movement in the fractures, reducing the travel time significantly.

15439 (NUREG/CR—4730) **Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids.** Siskind, B.; MacKenzie, D.R.; Bowerman, B.S.; Kempf, C.R.; Piciulo, P.L. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Waste Management). Jan 1987. Contract AC02-76CH00016. 172p. (BNL-NUREG—52019). NTIS MF A01- GPO. File Number TI87005636.

This report presents the results of follow-on studies conducted by Brookhaven National Laboratory (BNL) for the Nuclear Regulatory Commission (NRC) on certain kinds of low-level waste (LLW) which could also be classified as hazardous waste subject to regulation by the Environmental Protection Agency (EPA). Such LLW is termed "mixed waste." Additional data have been collected and evaluated on two categories of potential mixed waste, namely LLW containing metallic lead and LLW containing chromium. Additionally, LLW with organic liquids, especially liquid scintillation wastes, are reviewed. In light of a proposed EPA rule to list used oil as hazardous waste, the potential mixed waste hazard of used oil contaminated with radionuclides is discussed. It is concluded that the EPA test for determining whether a solid waste exhibits the hazardous characteristic of extraction procedure toxicity does not adequately simulate the burial environment at LLW disposal sites, and in particular, does not adequately assess the potential for dissolution and transport of buried metallic lead. Also, it is found that although chromates are, in general, not a normal or routine constituent in commercial LLW, light water reactors which do use chromates might find it beneficial to consider alternative corrosion inhibitors. In addition, it is noted that if used oil is listed by the EPA as hazardous waste, LLW oil may be managed by a scheme including one or more of the following processes: incineration, immobilization, sorption, aqueous extraction and glass furnace processing. 59 refs., 22 figs., 37 tabs.

15440 (NUREG/CR—4737) **Interpretative analysis of data for solute transport in the unsaturated zone.** Fuentes, H.R.; Polzer, W.L. (Los Alamos National Lab., NM (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Waste Management). Jan 1987. Contract W-7405-ENG-36. 240p. (LA—10817-MS). NTIS, PC A11/MF A01 - GPO. File Number TI87004848.

In this report, the movement of iodide, bromide, and lithium under unsaturated flow conditions is modeled using the computer code CFITIM. This code is a solution of the one-dimensional convective-dispersive equation when steady-state flow exists and when interactions between the solute and Bandelier tuff can be described by the linear isotherm. The model predicts well the transport of the solutes iodide, bromide, and lithium when flow conditions are near steady-state. When assuming average steady-state flow conditions, the model predicts dispersion factors for unsteady flow within one to two orders of magnitude of the predictions at steady-state flow; retardation factors, on the other hand, are predicted much better than the dispersion factors. Differences in the estimated dispersion coefficients for solutes of two steady-state pulses indicate that the intended replication of those steady-state flow pulses was not achieved during experimentation. A comparison of breakthrough curves of solutes from one depth to another in the 3-m x 6-m field experimental caisson indicates poor conservation of solute mass during transport.

15441 (ORNL/TM—10226) **Americium product solidification and disposal.** Mailen, J.C.; Campbell, D.O.; Bell, J.T.; Collins, E.D. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005271.

The americium product from the TRUEX processing plant needs to be converted into a form suitable for ultimate disposal. An evaluation of the disposal based on safety, number of process steps, demonstrated operability of the processes, production of low-level alpha waste streams, and simplicity of maintenance with low radiation exposures to personnel during maintenance, has been made. The best process is to load the americium on a cation exchange resin followed by calcination or oxidation of the resin after loading.

15442 (PNL—5750-Pt.5, pp 31-33) **Technical assistance to Department of Energy/Office of Operational Safety Assurance Program for remedial action.** Denham, D.H.; Cross, F.T.; Kennedy, W.E. Jr.; Marks, S.; Soldat, J.K.; Stenner, R.D. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

This project was initiated in FY 1984 to provide technical assistance to the Department of Energy (DOE), Office of Operational Safety (OOS) in developing and implementing its Assurance Program for Remedial Action (APRA), i.e., overview of the DOE remedial action programs. During this second year of the project,* the technical assistance included report and procedure reviews, and assistance with conducting the Uranium Mill Tailings Remedial Action Program (UMTRAP) Office (DOE/AL) appraisal. This included participation in preappraisal visits to UMTRAP sites in Canonsburg, Pennsylvania; Grand Junction, Colorado; and Salt Lake City, Utah. Pacific Northwest Laboratory (PNL) also transferred the PNL-developed document review software to the Oak Ridge Associated Universities (ORAU) staff in Grand Junction, Colorado, in anticipation of future document reviews by the ORAU staff. Other accomplishments have included publication of two formal documents and three project reports, preparation and presentation of five topical reports at national and international meetings, two foreign trip reports, and comments on proposed draft standards of the Environmental Protection Agency (40 CFR 193). The project manager has also participated on National Council on Radiation Protection and Measurements (NCRP) and American Society for Testing and Materials (ASTM) subcommittees developing decommissioning standards, as well as International Atomic Energy Agency (IAEA) advisory groups developing environmental monitoring guidelines.

15443 (PNL—5750-Pt.5, pp 35-37) **Environmental protection support and assistance.** Kennedy, W.E. Jr.; Corley, J.P.; McLaughlin, T.J.; Jaquish, R.E.; Hawley, K.A.; Washburn, D.K.; Peloquin, R.A.; Stenner, R.D.; Van Houten, N.C.; Adams, R.C.; Imhoff, K.L. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

The Pacific Northwest Laboratory (PNL) continued to provide technical assistance to the Department of Energy (DOE) Office of Operational Safety (OOS) in the area of environmental protection. PNL's technical assistance included development of revised DOE guidance for estimating population doses from exposure to radioactive materials, preparation of the annual DOE environmental summary, initial development of a standardized environmental protection information system, and development of a draft budgetary priority ranking method for identified ES & H upgrade projects. As part of the PNL ad hoc efforts, an independent evaluation was provided to OOS of the potential radiation doses to the public for the historical (1953-1984) uranium effluents to air and water resulting from operations at the Feed Materials Production Center (FMPC) located near Fernald, Ohio. PNL also supported OOS by providing extensive planning, local arrangements, and coordination of the published proceedings for the Fifth DOE Environmental Protection Information Meeting, which was held in Albuquerque, New Mexico November 6-8, 1984.

15444 (PNL—5750-Pt.5, pp 39-40) **Hazard waste risk assessment.** Hawley, K.A.; Napier, B.A. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

Pacific Northwest Laboratory continued to provide technical assistance to the Department of Energy (DOE) Office of Operational Safety (OOS) in the area of risk assessment for hazardous and radioactive-mixed waste management. The overall objective is to provide technical assistance to OOS in developing cost-effective risk assessment tools and strategies for bringing DOE facilities into compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) and the Resource Conservation and Recovery Act (RCRA). Major efforts during FY 1985 included (1) completing the modification of the Environmental Protection Agency (EPA) Hazard Ranking System (HRS) and developing training manuals and courses to assist in field office implementation of the modified Hazard Ranking System (mHRS); (2) initiating the development of a system for reviewing field office HRS/mHRS evaluations for appropriate use of data and appropriate application of the methodology; (3) initiating the development of a data base management system to maintain all field office HRS/mHRS scoring sheets and to support the master OOS environmental data base system; (4) developing implementation guidance for Phase I of the DOE CERCLA Program, Installation Assessment; (5) continuing to develop an objective, scientifically based methodology for DOE management to use in establishing priorities for conducting site assessments under Phase II of the DOE CERCLA Program, Confirmation; and (6) participating in developing the DOE response to EPA on the proposed listing of three sites on the National Priorities List.

15445 (PNL—5929) **Nuclear Waste Treatment Program: Qualification of commercial high-level waste forms: Approach and status.** Brouns, R.A.; Kuhn, W.L. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1986. Contract AC06-76RL01830. 30p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87003354.

In this document, the Nuclear Waste Treatment Program (NWTP) proposes an approach for demonstrating compliance with acceptance specifications. The proposed approach relies first on developing models of the process (vitrification) and product (waste form) to relate measurable process variables to the product quality, and then on using process control and sampling of melter feed input as the quality control method. Coordinated test programs, using pilot-scale nonradioactive and radioactive tests, will be used to establish these models at the confidence level needed to assure compliance to waste acceptance specifications. The test programs are broadly focused to encompass the range of anticipated future wastes, but the results should also be equally applicable to current wastes as well. Demonstration of waste form compliance by some other method would likely require extensive product testing, including glass sampling during production and routine destructive examination of canisters. The process and product modeling approach eliminates the need for this type of testing and should result in a very high level of statistical confidence that the individual waste forms are acceptable for disposal.

15446 (PNL-SA—13772) **Evaluation of Synroc-C as a second generation waste form.** Shade, J.W. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1986. Contract AC06-76RL01830. 8p. (CONF-860910—3). NTIS, PC A02. File Number DE87004918.

From 2. international conference on radioactive waste management; Winnipeg, Manitoba, Canada (7 Sep 1986).

Synroc-C was evaluated as a candidate second generation waste form, relative to 76-68 borosilicate glass, by leach testing both monolithic and powdered samples at 90°C and 150°C in brine and silicate solutions. Additional short-term tests were made at low surface-area-to-volume ratios between 90°C and 250°C to estimate forward-direction leach rates and activation energies. Dissolution rates of Cs, Mo, Ba, and U indicated that Synroc-C generally performed about an order of magnitude better than 76-68 glass. The release of Cs and Mo from Synroc may be from intergranular regions initially. Activation energies for these two elements from glass were about 9 kcal/mol, but were less than 3 kcal/mol from Synroc-C.

15447 (PNL-SA—14054) **Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine.** Gray, W.J. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1986. Contract AC06-76RL01830. 22p. (CONF-861207—56). NTIS, PC A02/MF A01; GPO Dep. File Number DE87004923.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Spent fuel and unirradiated UO_2 were previously reported to have exhibited a 100-fold difference in the total amount of uranium released during static leach tests in salt brine. Two additional studies designed to investigate that differences have now been completed. The first study involved leach tests with UO_2 pellets that had been doped with plutonium to simulate the alpha activity in spent fuel. The second study consisted of leach tests on spent fuel specimens that originated in the same reactor assembly as those used in previous tests but handled differently following discharge from the reactor. Results from the recently completed tests show that at least 90% of the reported difference between spent fuel and UO_2 can be attributed to an apparent surface oxidation of the spent fuel specimens after their discharge from the reactor. The effect of alpha radiolysis on the leaching of spent fuel and UO_2 in salt brine in the presence of an air atmosphere was found to be relatively small in these tests.

15448 (SAND—86-2414C) **Waste glass leaching: Chemistry and kinetics.** Bunker, B.C. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 15p. (CONF-861207—53). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005059.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Nuclear waste glass leaching has been studied extensively during the past ten years. Although much has been learned concerning the kinetics and mechanisms of glass dissolution, it does not appear that accurate predictions can yet be made concerning the release kinetics for specific elements from a given glass as a function of environmental conditions. In order to reliably predict elemental release rates, one needs to know: (1) how a given element is incorporated into the glass structure, (2) how specific sites in the glass react with water, (3) how the composition and reactivity of the leachate influence glass reactivity, (4) how the structure and reactivity of the glass changes in surface alteration layers, and (5) how glass dissolution modifies the chemistry of the leachate. At our current level of understanding, we are only able to make qualitative predictions concerning each of the above factors which allow us to make "order of magnitude" or "upper limit" predictions for radionuclide release rates.

15449 (SAND—86-7161) **Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site.** Kelley, V.A.; Pickens, J.F. (Intera Technologies, Inc., Austin, TX (USA); Sandia National Labs., Albuquerque, NM (USA)). Dec 1986. Contract AC04-76DP00789. 232p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE87005212.

Tracer tests utilizing conservative organic tracers have been conducted in the Culebra Dolomite Member of the Rustler Formation at the locations of the H-2, H-3, H-4,and H-6 hydropads. The objective of this report is to present a quantitative evaluation of the physical solute-transport parameters of the Culebra dolomite at the H-3 and H-4 hydropad locations from interpretation of the tracer-test data. The tracer-test configurations consisted of a pumping well and two tracer-addition wells arranged in approximate equilateral triangles with 30-m sides. The transport of organic tracers from the tracer-addition wells to the pumping wells was analyzed using the finite-difference model SWIFT II, which is capable of simulating single- and double-porosity flow and transport. 75 refs., 17 tabs.

15450 (SAND—86-7172) Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology. Bennett, R.H.; Burns, J.T.; Li, H.; Percival, C.M.; Lipkin, J. (Naval Ocean Research and Development Activity, NSTL, MS (USA); Sandia National Labs., Albuquerque, NM (USA)). Jan 1987. Contract AC04-76DP00789. 78p. NTIS, PC A05/MF A01. File Number DE87005214.

Single sensor piezometer probes, 8mm in diameter were developed and tested for deep-ocean geotechnical investigations in support of the Subseabed Disposal Program. Two probes were tested in a hyperbaric chamber pressurized to 55 MPa (8000 psi) during a scaled (0.28: 1) simulation experiment conducted at the David Taylor Naval Ship Research and Development Center (DTNSRDC) in Annapolis, Md. Testing was performed for 30 days with the probes inserted in reconstituted illitic marine sediment. Small differential pore-water pressures were generated in response to both mechanically and thermally generated forcing functions. The piezometers sensed very small (approximately 1.7 kPa (0.25 psi)) pore water pressure events during the process of carrying out other experimental objectives. The pressure sensors exhibited excellent sensitivity and stability during other deep-ocean simulated laboratory pressure tests for periods of up to 750 hours. In addition to the measurements of ambient and dynamic pore pressure response to environmental forces, the piezometer test data can be used to derive the in situ undrained shear strengths and permeabilities of seabed sediments. The piezometer probe technology is providing a quantitative means of assessing important geotechnical parameters of fine-grained seabed deposits. 22 refs., 28 figs., 10 tabs.

15451 (UCRL—53726) Reference waste package environment report. Glassley, W.E. (Lawrence Livermore National Lab., CA (USA)). 1 Oct 1986. Contract W-7405-ENG-48. 30p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005588.

One of three candidate repository sites for high-level radioactive waste packages is located at Yucca Mountain, Nevada, in rhyolitic tuff 700 to 1400 ft above the static water table. Calculations indicate that the package environment will experience a maximum temperature of ~230°C at 9 years after emplacement. For the next 300 years the rock within 1 m of the waste packages will remain dehydrated. Preliminary results suggest that the waste package radiation field will have very little effect on the mechanical properties of the rock. Radiolysis products will have a negligible effect on the rock even after rehydration. Unfractured specimens of repository rock show no change in hydrologic characteristics during repeated dehydration-rehydration cycles. Fractured samples with initially high permeabilities show a striking permeability decrease during dehydration-rehydration cycling, which may be due to fracture healing via deposition of silica. Rock-water interaction studies demonstrate low and benign levels of anions and most cations. The development of sorptive secondary phases such as zeolites and clays suggests that anticipated rock-water interaction may produce beneficial changes in the package environment.

15452 (UTRCN-S—8) Report of the symposium on 'total research on long life radioactive waste management' in the Research Center for Nuclear Science and Technology, Univ. of Tokyo. (Tokyo Univ. (Japan). Research Center for Nuclear Science and Technology). Nov 1984. 92p. (In Japanese). (CONF-8311300—Summs.). NTIS (US Sales Only), PC A05/MF A01. File Number DE87701241.

From Symposium on total research on long life radioactive waste management; Tokyo, Japan (25 Nov 1983).

The summaries of the lectures on "Report of Research Expert Committee of the US Science Academy on the propriety of the land disposal of high level wastes", "ICRP recommendation and safety evaluation on disposal of radioactive wastes - Long half-life nuclides such as transuranic elements", "Behavior of tritium in environment", "Research on the safety of high level wastes in the Japan Atomic Energy Research Institute", "On distribution coefficient Kd", "Hydraulic conductivity of strata related to the stratum disposal of radioactive wastes", "Biological base of the safety control of plutonium" are collected in this report. (Kako, I.).

15453 Defining greater-than-class-C low-level radioactive waste. Knecht, M.A.; Oztunali, O.I. (Idaho National Engineering Lab., Idaho Falls). *Transactions of the American Nuclear Society;* **53**: 94-95(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) was signed by President Reagan on January 15, 1986. This act requires the federal government to be responsible for the disposal of greater-than-class-C low-level radioactive waste (LLRW) that is generated commercially by state agencies and by federal entities (other than waste generated by atomic weapons research, development, or testing, or by decommissioning of vessels of the nuclear navy). To plan for disposal, the federal government will require estimates of the volume of waste involved and characterization of this waste. A clear definition of greater-than-class-C LLRW is the first step in determining what wastes will be included in the waste to be received by the federal government. This definition will influence major policy decisions to be made for management of such waste. The purpose of this paper is to examine the existing information on greater-than-class-C LLRW in view of the current definition of such waste and potential changes in this definition - for example, an upper limit on the concentrations of radionuclides in LLRW. The paper identifies further information needs to develop a clear definition of such waste for use in federal planning for acceptance of responsibility for disposal of such waste.

15454 Transuranic waste disposal in the United State. Thompson, J.D. (Rockwell International, Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 95(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US is unique in having created a special class of radioactive waste disposal based on the concentration of transuranic (TRU) elements in the waste. Since 1970, the US has been placing newly generated TRU waste in retrievable storage. It is intended that these wastes will be placed in a permanent deep geologic repository, the Waste Isolation Pilot Plant (WIPP). The WIPP opening for a demonstration emplacement period is set for October 1988. Transuranic wastes derive from some of the manufacturing and research activities carried out by the US Department of Energy (DOE). The bulk of this waste is generated in plutonium parts fabrication activities. A variety of plutonium-contaminated materials ranging from glove boxes, high-efficiency particulate air filters, and machine tools, to chemical sludges derived from plutonium recovery streams are stored as TRU wastes. Other processes that generate TRU waste are plutonium production operations, preparation for and cleanup from fuel reprocessing, manufacturing of plutonium heat sources, and nuclear fuel cycle research activities. Extensive procedures will be used to examine and prepare waste before it is placed in the WIPP for disposal. After the WIPP opens, certified waste will be transported to it and emplaced in the repository.

15455 Evaluation of the potential for deregulated disposal of very low level wastes from nuclear power plants. Davis, J.P. *Transactions of the American Nuclear Society;* **53**: 95-96(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

At the present time essentially all low-level (radioactive) waste (LLW) from nuclear power plants may be disposed of only by transfer to a licensed disposal facility, pursuant to the requirements of US Nuclear Regulatory Commission (NRC) regulations, 10CF20 and 10CFR61. Even waste streams that contain extremely small quantities of radioactive material of plant origin or possibly contain such materials are subject to these requirements. These very low level wastes (VLW) do not pose a significant radiological risk to public health, and their treatment as Part 61 LLW may impose disproportionate or unwarranted costs on the public. The purpose of this study is to review the characteristics of LLW streams generated in nuclear power facilities to determine which may be suitable for disposal by methods other than transfer to an NRC-licensed facility and to evaluate the benefits, risks, and costs of exempting such VLW from the disposal requirements of 10CFR

parts 20 and 61. This information would be appropriate for use in support of petitions for rulemaking or exemption requests.

15456 **Criteria for waste-related risks to be below regulatory concern.** Trubatch, S.L. (Commonwealth Edison Co., Chicago, IL). *Transactions of the American Nuclear Society;* **53**: 96-97(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper describes and analyzes the criteria recently established by the US Court of Appeals for the District of Columbia Circuit for determining that a risk is de minimis, i.e., below regulatory concern (BRC), for the purpose of the Atomic Energy Act of 1954, as amended, 42 USC 2011 et seq. The court established these BRC criteria incidentally during its review of intervenors' challenge to the US Nuclear Regulatory Commission's (NRC's) issuance of an operating license for the Diablo Canyon Nuclear Power Plant. In the course of that licensing proceeding, the NRC had determined that its regulations did not require it to consider the complicating effects of earthquakes on emergency planning. Although the legal standard and its quantitation arose in the context of emergency planning, these criteria are equally applicable to waste-related risks cognizable under the Atomic Energy Act. These criteria imply that the NRC, when licensing a waste repository, need not consider the risk of a catastrophic accident having a frequency of occurrence of less than one chance in one hundred thousand per year.

15457 **Disposal of BRC wastes containing short-lived radionuclides.** Rogers, V.C.; Baird, R.D. (Rogers & Associates Engineering Corp., Salt Lake City, UT). *Transactions of the American Nuclear Society;* **53**: 97-98(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

As part of its responsibility for the safe disposal of low-level (radioactive) waste (LLW), the Texas Low-Level Radioactive Waste Disposal Authority sponsored an analysis of the use of permitted sanitary landfills for the disposal of wastes containing only low concentrations of radionuclides with half-lives of <300 days. Analyses have been performed giving limits on concentrations and total curies annually disposed for 56 short-lived radionuclides. The Low-Level Radioactive Waste Policy Amendments Act, enacted in December 1985, has directed the US Nuclear Regulatory Commission (NRC) to develop standards and procedures for considering and acting on petitions for below regulatory concern (BRC) radioactive waste disposal within 6 months. The NRC has developed a de minimis biomedical waste disposal rule for H-3 and C-14 that places limits on concentrations that can be disposed of without regard to radioactivity. Likewise, the US Environmental Protection Agency (EPA) is developing a regulation for the disposal of BRC radioactive wastes in a sanitary landfill as part of their LLW disposal rulemaking. The purpose of this study is to: 1) conduct multipathway risk assessments using the same methodology that is being used by the EPA for the technical support of their BRC rulemaking; 2) obtain radionuclide concentration and annual total curie limits from the results of the risk assessments by limiting the health impacts to guideline values used in this analysis; and 3) present other restrictions or conditions that emerge from the analysis.

15458 **Proposed classification scheme for high-level and other radioactive wastes.** Kocher, D.C.; Croff, A.G. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* **53**: 98-100(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Nuclear Waste Policy Act (NWPA) of 1982 defines high-level (radioactive) waste (HLW) as (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel...that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission...determines...requires permanent isolation. This paper presents a generally applicable quantitative definition of HLW that addresses the description in paragraph B. The approach also results in definitions of other wastes classes, i.e., transuranic (TRU) and low-level waste (LLW). The basic waste classification scheme that results from the quantitative definitions of highly radioactive and requires permanent isolation is depicted. The concentrations of radionuclides that correspond to these two boundaries, and that may be used to classify radioactive wastes, are given.

15459 **Approach to defining de minimis, intermediate, and other classes of radioactive waste.** Cohen, J.J.; Smith, C.F. (SAIC, Pleasanton, CA). *Transactions of the American Nuclear Society;* **53**: 100-102(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This study has developed a framework within which the complete spectrum of radioactive wastes can be defined. An approach has been developed that reflects both concerns in the framework of a radioactive waste classification system. In this approach, the class of any radioactive waste stream is dependent on its degree of radioactivity and its persistence. To be consistent with conventional systems, four waste classes are defined. In increasing order of concern due to radioactivity and/or duration, these are: 1. De Minimis Wastes: This waste has such a low content of radioactive material that it can be considered essentially nonradioactive and managed according to its nonradiological characteristics. 2. Low-Level Waste (LLW): Maximum concentrations for wastes considered to be in this class are prescribed in 10CFR61 as wastes that can be disposed of by shallow land burial methods. 3. Intermediate Level Waste (ILW): This category defines a class of waste whose content exceeds class C (10CFR61) levels, yet does not pose a sufficient hazard to justify management as a high-level waste (i.e., permanent isolation by deep geologic disposal). 4. High-Level Waste: HLW poses the most serious management problem and requires the most restrictive disposal methods. It is defined in NWPA as waste derived from the reprocessing of nuclear fuel and/or as highly radioactive wastes that require permanent isolation.

15460 **Economics of disposal at future disposal facilities.** Scoville, J.J. *Transactions of the American Nuclear Society;* **53**: 110-112(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Passage of the Low-Level Waste Policy Act of 1980 clearly leaves the responsibility for the disposal of low-level (radioactive) waste (LLW) at the doorstep of the state capitol of the state of origin. Fortunately, this does not mean that the future will see each state operating its own LLW disposal facility. The provision for regional compacts specifically provides that states may work together to solve the problem of waste disposal. As is the case with many political solutions to problems, the Low-Level Waste Policy Act does not address economics nor was the cost of disposal a factor in the debate leading to ultimate passage of the act. Also, with the passage of the Low-Level Waste Policy Act Amendment of 1985, significant surcharges will be experienced by generators in regions not yet providing their own LLW disposal. The generators of these wastes are seriously asking questions as to the future costs of disposal. While a comprehensive study of future costs must await detailed disposal facility design, some estimates can be made based on the volume of waste generated in a compact region and on the conceptual design of the facility. It is the purpose of this paper to present some of these estimates for the regions that seem to be establishing fairly fixed political boundaries.

15461 **Effect of technology on the economics of low-level waste disposal.** Jones, D.F.; Brooks, E.T. *Transactions of the American Nuclear Society;* **53**: 112-113(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this paper is to discuss the economics of establishing and operating a low-level radioactive waste (LLW) disposal site under current conditions and with the application of various technologies. Topics include: economic considerations, initial capital investment, return on investment, operating profit, disposal volume and price, and impact of advanced technologies. The business aspects of establishing and operating LLW disposal sites in the US are the changed product of a truly new era.

15462 **Modeling the economics of LLW volume reduction.** Voth, M.H.; Witzig, W.F. (Pennsylvania State Univ., University Park). *Transactions of the American Nuclear Society;* 53: 113-115(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Generators of low-level (radioactive) waste (LLW) are under pressure to implement volume reduction (VR) programs for political and economic reasons. Political reasons include the appearance of generating less waste or meeting quotas. Economic reasons include avoiding high disposal costs and associated surcharges. Volume reduction results in less total volume over which fixed disposal costs are allocated and therefore higher unit costs for disposal. As numerous small compacts are developed, this often overlooked effect becomes more pronounced. The described model presents two unique significant features. First, a feedback loop considers the impact of VR on disposal rates, and second, it appeals to logic without extensive knowledge of VR technology or computer modeling. The latter feature is especially useful in conveying information to students and nontechnical decision makers, demonstrating the impact of each of a complicated set of variables with reproducible results.

15463 **Cost effectiveness for improved methods of low-level radioactive waste disposal.** Cohen, J.J.; Pasternak, A. (SAIC, Pleasanton, CA). *Transactions of the American Nuclear Society;* 53: 115(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Concerns over the siting and operation of low-level (radioactive) waste (LLW) disposal facilities have stimulated efforts to develop improved (safer) methods for LLW management. In certain states, legislation has been proposed that would require more stringent controls for LLW disposal sites than would normally be required to assure compliance with provisions of 10CFR61. To determine the cost effectiveness of the required improvements, a cursory (generic) cost-benefit analysis has been performed. If the requirement for enhanced LLW disposal is intended primarily to obtain public confidence, then its cost effectiveness must be determined in terms of that objective. No evidence has been found of any systematic study that would indicate the effect of increasingly restrictive controls on public confidence/acceptance.

15464 **Economic considerations for nuclear power plant LLW.** Shaw, R.A. (Electric Power Research Institute, Palo Alto, CA). *Transactions of the American Nuclear Society;* 53: 115-116(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

So many factors influence the economics of the production, processing, packaging, and disposal of low-level (radioactive) wastes (LLW) at a nuclear power plant that it is necessary to consider these elements as part of the system. One of the easiest and most direct ways of reducing the costs of radioactive wastes is to reduce the source. A second technique involves the processing of the radioactive wastes. One change under consideration by the US Nuclear Regulatory Commission could have significant economic consequences on LLW for nuclear power plants. This change is the potential for identifying concentrations of radioisotopes that are below regulatory concern, and, therefore, can be disposed of as normal, everyday wastes. The conclusion is that the various elements that are a part of the whole chain of the waste disposal system from source to disposal must be considered when economic decisions are made in any one of the elements. Results are presented showing how the various elements influence total costs when considering various typical plant waste generation scenarios. In addition, the changes in the regulations and the cost structure associated with waste disposal will also significantly influence these economic decisions, as will be shown through the effect of current and near-future disposal surcharges and probably need for utility short-term on-site storage capability.

15465 **Cost effectiveness of below-threshold waste disposal at DOE sites.** Wickham, L.E.; Smith, C.F.; Cohen, J.J. (EG & G Idaho, Idaho Falls). *Transactions of the American Nuclear Society;* 53: 116(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Previous study has indicated the feasibility of establishing a threshold of concentration below which certain low-level (radioactive wastes) (LLW) could be safely handled and disposed of by conventional means such as landfills. Such below-threshold wastes have been synonymously termed de minimis or below regulatory concern (BRC) and can be deemed appropriate for management according to their nonradiological characteristics. The objective of this study was to determine the cost effectiveness for management and disposal of below-threshold waste at certain US Department of Energy sites. The sites selected for this study were the Idaho National Engineering Laboratory and Savannah River Laboratory. Cost-benefit analysis was used to determine the impacts, benefits, and potential cost advantages of establishing and implementing a threshold limit.

15466 **Radiation doses in alternative commercial high-level waste management systems.** Schneider, K.J.; Pelto, P.J.; Lavender, J.C.; Daling, P.M.; Fecht, B.A. (Pacific Northwest Lab., Richland, WA). *Transactions of the American Nuclear Society;* 53: 121-122(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the commercial high-level waste management system, potential changes are being considered that will augment the benefits of an integral monitored retrievable storage (MRS) facility. The US Department of Energy (DOE) has recognized that alternative options could be implemented in the authorized waste management system (i.e., without an integral MRS facility) to potentially achieve some of the same beneficial effects of the integral MRS system. This paper summarizes those DOE-sponsored analyses related to radiation doses resulting from changes in the waste management system. This report presents generic analyses of aggregated radiation dose impacts to the public and occupational workers, of nine postulated changes in the operation of a spent-fuel management system without an MRS facility.

15467 **Alternative low-level waste processing techniques.** Witt, L.A. (ATCOR Inc., Peekskill, NY). *Transactions of the American Nuclear Society;* 53: 125-126(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents some new and innovative ways to use commercially available process shields to reduce utility low-level radioactive waste processing costs. With the current market demanding more and more dewatering and in-container solidification, it has become necessary to look for way to offset contractor demurrage and detention charges on casks. Through the use of inexpensive on-site storage containers (OSSCs) with specially designed lids, the cost for processing is significantly reduced. These OSSCs, with secondary ports, allow for in-container dewatering or solidification, thereby amply offsetting cask demurrage charges assessed by mobile service contractors. Several versions of these OSSCs are available to the industry. They range in capacity from 7.35 to 3000 ft^3 and each can be tailored to meet a customer's specific on-site requirements, as well as the requisite compatibility with currently licensed transport containers. Each can be equipped with special lids to accommodate various types of both in-plant and mobil processing systems. The design basis of these processing containers is based on a concrete structure with heavy steel reinforcement.

15468 **Operating a transportable volume reduction and solidification system (TVR-III).** Doyle, R.D.; Rastberger, S.B. (Associated Technologies, Inc., Charlotte, NC). *Transactions of the American Nuclear Society;* 53: 126-127(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The first liquid-waste transportable volume reduction and solidification system (TVR-III) began operation at Clinton Power Station in the spring of 1986. Processing of radioactive material will begin in August 1986 at the Palo Verde Nuclear Generating Station. The TVR-III system is mounted on a 3-m (10-ft)-wide x 14-m (46-ft)-long double low-boy trailer that requires minimal space and

interface connections within the plants, thereby minimizing the impact on plant operations. The one-step volume reduction and bitumen solidification process is well proven with many systems operating on both boiling water reactor (BWR) and pressurized water reactor nuclear power plants in France and Japan.

15469 **Prediction of critical grout parameters: critical flow rate.** Tallent, O.K.; McDaniel, E.E.; Godsey, T.T.; Dodson, K.E. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* **53**: 127-129(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Waste disposal is rapidly becoming one of the most important technological endeavors of the authors time, and fixation of waste in cement-based materials is an important part of the endeavor. Investigations of given wastes are usually individually conducted and reported. In this study, data obtained from investigation of critical flow rates for three distinctly different wastes are correlated with apparent viscosity data via a single empirical equation. Critical flow rate, which is an important variable in waste grout work, is defined as the flow rate at which a grout must be pumped through a reference pipe to obtain turbulent flow. It is important that the grout flow be turbulent, since laminar flow allows caking on pipe walls and causes eventual plugging. The three wastes used in this study can be characterized as containing (a) high nitrate, carbonate, and sulfate; (b) high phosphate; and (c) high fluoride, ammonium, an suspended solids waste.

15470 **Problems of interpretation in implementing the low-level waste act.** Trubatch, S.L. *Transactions of the American Nuclear Society;* **53**: 130(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA), like any other statute, presents problems of interpretation that become evident only when attempts are made to implement the statutory language. This paper discusses some of the interpretation problems that utilities have already had to address in evaluating the impact of LLRWPAA on their low-level waste (LLW) disposal operations. These problems include the following specific questions and answers: Does a nonoperating but licensed reactor have an allotment of capacity for disposing of radioactive LLW? Is a full-power operating license limited to 5% of rated power a full-power operating license for the purpose of computing the 15-month delay period in calculating the LLW disposal capacity allotted to new reactors? Do the rules for allocating disposal capacity for unusual volumes of LLW require the separate treatment of each reactor of a multireactor facility? In addition to these specific problems of interpretation, this paper also addresses the general problem of just what is the legislative history available for helping with interpretations of the LLRWPAA's statutory language. Finally, this paper also illustrates how the LLRWPAA can affect the provisions in a regional compact ratified by the US Congress.

15471 **Optimized application of systems engineering to nuclear waste repository projects.** Miskimin, P.A.; Shepard, M. (BDM Corp.). *Transactions of the American Nuclear Society;* **53**: 131(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this presentation is to describe a fully optimized application of systems engineering methods and philosophy to the management of a large nuclear waste repository project. Knowledge gained from actual experience with the use of the systems approach on two repository projects is incorporated in the material presented. The projects are currently evaluating the isolation performance of different geologic settings and are in different phases of maturity. Systems engineering methods were applied by the principal author at the Waste Isolation Pilot Plant (WIPP) in the form of a functional analysis. At the Basalt Waste Isolation Project (BWIP), the authors assisted the intergrating contractor with the development and application of systems engineering methods. Based on this experience and that acquired from other waste management projects, an optimized plan for applying systems engineering techniques was developed. The plan encompasses the following aspects: project organization, developing and defining requirements, assigning work responsibilities, evaluating system performance, quality assurance, controlling changes, enhancing licensability, optimizing project performance, and addressing regulatory issues. This information is presented in the form of a roadmap for the practical application of system engineering principles to a nuclear waste repository project.

15472 **Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant.** Christensen, A.B.; Teuscher, D.R. *Transactions of the American Nuclear Society;* **53**: 131-132(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Idaho Chemical Processing Plant (ICPP) at the Idaho National Engineering Laboratory (INEL) stores solidified high-level waste and some spent reactor fuel in shallow underground containers. These materials generate heat, and their storage configuration must be sized to keep temperatures within allowable limits. Storage facility designs are based on computer-generated temperatures; however, actual measured temperatures taken later are much lower than these design values. Designs based on such overestimated values contribute to increased facility costs. In this paper, temperatures measured around a buried heat source are used to estimate accurate soil thermal properties that will improve the heat transfer model and improve future storage facility designs.

15473 **Solubility tests on borosilicate glasses for West Valley waste immobilization.** Feng, X.; Barkatt, A. (Catholic Univ., Washington, DC). *Transactions of the American Nuclear Society;* **53**: 133-135(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Systematic leach tests on West Valley related glasses were carried out to provide quantitative information on leachant composition as well as glass composition effects. Modeling of glass dissolution, intended to correlate durability of glasses with their chemical composition, was based on the thermodynamic approach developed by Plodinec and Jantzen. Type MCC-3 powder tests were used to find out the pH and solubilities of the current West Valley reference glass, glass A composition for the immobilization of West Valley high-level wastes. The results are shown. Based on these results, leach tests were carried out in a large number of buffered media, all of which were preadjusted to pH 10.4. The results are also shown.

15474 **Radionuclide transport through penetrations in nuclear waste containers.** Chambre, P.L.; Lee, W.W.L.; Kim, C.L.; Pigford, T.H. (Univ. of California, Berkeley). *Transactions of the American Nuclear Society;* **53**: 134-135(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In this paper the authors analyze radionuclide transport through penetrations in nuclear waste containers. Penetrations may result from corrosion or cracking and may be through the container material or through deposits of corrosion products. The analysis deals with the resultant radionuclide transport, but not with the way that these penetrations occur. Numerical illustrations are provided for diffusive nuclide flux through these apertures from mathematical expressions derived by Chambre. The US Nuclear Regulatory Commission's performance objective for the waste package subsystem requires substantially complete containment within the waste package from 300 to 1000 yr. Mass transfer through container holes may affect attaining substantially complete containment and may also affect compliance with the release rate requirement. Analysis of radionuclide transport through penetrations aids evaluation of individual barriers, such as Zircaloy cladding for spent fuel.

15475 **Cumulative releases of radionuclides from uncontained waste packages.** Lee, W.W.L.; Kim, C.L.; Chambre, P.L.; Pigford, T.H. (Univ. of California, Berkeley). *Transactions of the American Nuclear Society;* **53**: 135-136(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US Nuclear Regulatory Commission's performance objective for the waste package subsystem requires substantially complete containment of all radionuclides within the waste package for 300 to 1000 yr for anticipated processes and events. This requirement has been interpreted by repository projects as requiring an envelope around the waste solid that will not be penetrated for 300 to 1000 yr. To provide a technical basis for further interpretation of the containment requirement, however, mass-transfer theory can be used to predict the extent of radionuclide release from a waste solid into surrounding rock, even in the absence of a separate containment envelope. It is possible that the barrier system of waste solid, backfill, and rock can result in substantial containment within the waste solid and backfill during time periods of interest. Calculations of 1000- and 10,000-yr cumulative releases of radionuclides from a waste solid without separate containment are presented in this paper.

15476 **Mass transfer of soluble species into backfill and rock.** Chambre, P.L.; Kang, C.H.; Lee, W.W.L.; Pigford, T.H. (Univ. of California, Berkeley). *Transactions of the American Nuclear Society;* **53**: 136-137(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In a spent-fuel waste package placed in a geologic repository, the solublecesium and iodine isotopes accumulated in fuel-cladding gap, voids, and grain boundaries of spent-fuel rods are expected to dissolve rapidly when groundwater penetrates the fuel rods. Chambre's previous mass-transfer analyses and calculations by Kim et al. for spent fuel without backfill show that this soluble gap activity of cesium an iodine is the greatest contributor to fractional release rates for these radioelements into surrounding rock, in qualitative agreement with laboratory experiments on spent-fuel rods with locally perforated classing. Chambre has extended the mass-transfer analysis to include diffusion of soluble species through backfill into surrounding rock in one-dimensional planar geometry. Here the authors present numerical illustrations of release rates into porous rock as a function of backfill thickness for parameters typical of a wet-rock repository. Results are compared with the US Nuclear Regulatory Commission (NRC) criterion for release rates.

15477 **Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant.** Callan, J.E. (Savannah River Plant, Aiken, SC). *Transactions of the American Nuclear Society;* **53**: 478-479(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Defense Waste Processing Facility is being constructed at the Savannah River Plant at a cost of $870 million to immobilize the defense high-level radioactive waste. This radioactive waste is being added to borosilicate glass for later disposal in a federal repository. The borosilicate glass is poured into stainless steel canisters for storage. These canisters must be handled remotely because of their high radioactivity, up to 5000 R/h. After the glass has been poured into the canister which will be temporarily sealed, it is transferred to a decontamination cell and decontaminated. The canister is then transferred to the weld cell where a permanent cap is welded into place. The canisters must then be transported from the processing building to a storage vault on the plant until the federal repository is available. A shielded canister transporter (SCT) has been designed and constructed for this purpose. The design of the SCT vehicle allows the safe transport of a highly radioactive canister containing borosilicate glass weighing 2300 kg with a radiation level up to 5000 R/h from one building to another. The design provides shielding for the operator in the cab of the vehicle to be below 0.5 rem/h. The SCT may also be used to load the final shipping cask when the federal repository is ready to receive the canisters.

15478 **Equipment experience in a radioactive LFCM vitrification facility.** Holton, L.K. Jr.; Dierks, R.D.; Goles, R.W.; Sevigny, G.J.; Surma, J.E.; Thomas, N.M. (Pacific Northwest Lab., Richland, WA). *Transactions of the American Nuclear Society;* **53**: 479-481(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Under sponsorship of the US Department of Energy, the Pacific Northwest Laboratory has installed and is operating a pilot-scale radioactive liquid-fed ceramic melter (RLFCM) system in a shielded hot cell at Hanford, Washington. The system, designed to vitrify high-level liquid wastes has been in radioactive service for greater than two years. During that time, ~10 MCi of fission product activity has been converted to a borosilicate glass waste form. This paper discusses the specific remote equipment performance of the vitrification system.

15479 **Stainless steel decontamination manipulators.** Sullivan, R.J. *Transactions of the American Nuclear Society;* **53**: 482(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Three, large-volume coverage manipulator systems were designed and built for the Defense Water Processing Facility at the Savannah River Laboratory. These stainless steel systems will be used for high-pressure spray decontamination of waste containers and large process equipment modules. Each system has a manipulator arm, folding boom, and vertical drive and guide structure. Handling capacity is 45 kg, horizontal reach is 4.6 m with a 180-deg swing motion, and the vertical travel is 6 m. The system is remotely removable and replaceable in modules using an overhead crane and an impact wrench. The manipulator arm has seven motions: Shoulder rotation and pivot, elbow pivot, wrist pivot and rotation, and grip open-close. All motions are variable speed and are slip-clutch protected to prevent overloading from external forces (collisions).

15480 **Closed-circuit television and remote crane control for vitrification facilities.** Bennett, P.R.; Morrison, J.E. (PRC Systems Services, McLean, VA). *Transactions of the American Nuclear Society;* **53**: 482-484(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Defense Waste Processing Facility is currently under construction at the Savannah River Plant. Within the main process cell (MPC), a 117-ton capacity bridge crane is to be installed to facilitate remote handling and processing operations. E. I. du Pont de Nemours and Company defined and PRC designed and built an operational prototype closed-circuit television (CCTV) and remote control system. Phase I of the program developed the CCTV system to prove the feasibility of a remote viewing system. The phase II program added full crane functional remote control and installed it on an existing hot canyon crane. This prototype system established the criteria for the development of the MPC crane and future crane systems. Parameters were: (a) failsafe assurance, (b) high liability, (c) ease of maintenance for dressed-out personnel, (d) rapid malfunction diagnosis, (e) ergonomics, (f) known picture orientation, and (g) audio system to monitor operational sounds. The complete system has undergone a total demonstration of its operational capabilities using simulator circuits for crane functions and is now being integrated with the crane for a full operational demonstration. The system will then be mothballed pending installation by construction personnel ready for cold startup of the plant in 1988.

15481 **Remote lighting systems for the defense waste processing facility.** Heckendorn, F.M.; Divona, C.J. (Savannah River Plant, Aiken, SC). *Transactions of the American Nuclear Society;* **53**: 484(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Defense Waste Processing Facility (DWPF) is under construction at the Savannah River Plant. In DWPF, an immobilization process solidifies radioactive waste sludge by vitrification into a leach-resistant borosilicate glass. The mixture of waste and glass solidifies in stainless steel containers for eventual transportation to an off-site federal repository. The DWPF contains a number of hot cell canyons that are remotely maintained using only a crane and crane-held impact wrench for replacing the equipment. In general, viewing into these canyons is accomplished through shielded windows and by the use of closed-circuit television (CCTV). Demonstration of the prototype remote light fixtures for the DWPF

canyon was completed in 1984, and the actual plant equipment is scheduled for completion this year.

15482 Canister grapple for the defense waste processing facility. Walker, K.L.; White, J.R.; Farnstrom, K.A. (Remote Technology Corp., Oak Ridge, TN). *Transactions of the American Nuclear Society;* **53**: 489-490(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Radioactive waste processed at the Defense Waste Processing Facility (DWPF) will be vitrified and stored in Type 304L stainless steel canisters. A unique grapple will be utilized for all canister transfer operations within the DWPF. The grapple mechanism has been designed with a two-step release, requiring it to be set down twice before the canister will be released. A prototype of the grapple has been fabricated and tested. Production units are currently undergoing acceptance testing and will be shipped to the DWPF in August 1986.

15483 Remote viewing of melter interior: defense waste processing facility. Heckendorn, F.M. (Savannah River Lab., Aiken, SC). *Transactions of the American Nuclear Society;* **53**: 490-491(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Defense Waste Processing Facility (DWPF) is under construction at the Savannah River Plant. In DWPF, an immobilization process solidifies high-level radioactive waste material into a leach-resistant borosilicate glass. A molten mixture of waste and glass is produced in an electrically heated melter. The mixture is subsequently allowed to solidify in a stainless steel canister for eventual transportation to an offsite federal repository. An elaborate chemical process is used to remotely prepare the radioactive waste for conversion into the final glass matrix. A final mixture of concentrated radioactive waste and finely powdered glass frit is metered into the melter. Molten glass exits the melter into waiting canisters. The control and monitoring of the melter operation is crucial to the overall DWPF operation. A remote system has been developed and demonstrated for continuous viewing of the melter interior during all phases of its operation. Viewing of the interior is one of the best methods for confirming proper operation of the melter. It serves to confirm the sensor-based controls and provide sensing of unanticipated parameters.

15484 Demonstration of a remotely operated TRU waste size-reduction and material handling process. Stewart, J.A. III. (Savannah River Lab., Aiken, SC). *Transactions of the American Nuclear Society;* **53**: 498-499(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Noncombustible ^{238}Pu and ^{239}Pu waste is generated as a result of normal operation and decommissioning activity at the Savannah River Plant and is being retrievably stored at the Plant. As part of the long-term plant to process the wastes for permanent disposal, a remote size-reduction and material handling process is being cold-tested at Savannah River Laboratory to provide design support for the Plant TRU Waste Facility scheduled to be completed in 1992. Testing of the equipment in a complete cold demonstration, known as the Components Test Facility, is scheduled to begin in November 1986 and will run through 1987.

15485 Operation of a radiochemical uranium nitrate solidification facility. McGinnis, C.P.; Collins, E.D. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* **53**: 155-156(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A unique radiochemical processing facility at Oak Ridge National Laboratory has been operated to convert ~1000 kg of highly fissile and radioactive uranium (containing ~76% ^{236}U, ≈10% ^{233}U, and ~140 ppm ^{232}U) in the form of a nitrate solution to a packaged solid oxide that is suitable for safe storage. The project was called the Consolidated Edison Uranium Solidification Program (CEUSP) because the uranium was the product of an experimental power reactor fuel, consisting of fully enriched ^{235}U and thorium, which was irradiated in the Indian Point-1 Reactor in the early 1960s. The irradiated fuel was reprocessed at the Nuclear Fuel Services's plant at West Valley, New York in late 1968, and the uranium product solution was transported to Oak Ridge and stored. The material was originally considered quite valuable, but the intense radiation associated with the decay of ^{232}U precluded further use. Several options were explored to solidify the material for safe storage. This paper will describe the design and development of the solidification process and review the operation history.

15486 Materials aspects of nuclear waste isolation. Bennett, J.W. (US Dept. of Energy, Washington, DC). pp 87-91 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

This paper is intended to provide an overview of the nuclear waste repository performance requirements and the roles which we expect materials to play in meeting these requirements. The objective of the U.S. Dept. of Energy's (DOE) program is to provide for the safe, permanent isolation of high-level radioactive wastes from the public. The Nuclear Waste Policy Act of 1982 (the Act) provides the mandate to accomplish this objective by establishing a program timetable, a schedule of procedures to be followed, and program funding (1 mil/kwhr for all nuclear generated electricity). The centerpiece of this plan is the design and operation of a mined geologic repository system for the permanent isolation of radioactive wastes. A nuclear waste repository contains several thousand acres of tunnels and drifts into which the nuclear waste will be emplaced, and several hundred acres for the facilities on the surface in which the waste is received, handled, and prepared for movement underground. With the exception of the nuclear material-related facilities, a repository is similar to a standard mining operation. The difference comes in what a repository is supposed to do - to contain an isolate nuclear waste from man and the environment.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 15413, 15440, 15452, 15561, 15562, 16919

15487 (BMI/ONWI—617) Rail transportation corridor analysis report: Deaf Smith County location in the Palo Duro Basin, Texas. (NUS Corp., Gaithersburg, MD (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Oct 1986. Contract AC02-83CH10140. 206p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE87005576.

An environmental data base was developed for the purpose of preliminary siting of potential rail access corridors between existing rail lines and the potential repository site in Deaf Smith County, Texas. The categories of the data base were environmental conditions considered significant in rail line construction and operation. These included land cover, population areas, slope, surface hydrology, cultivated prime agricultural lands, cultural features, and utility rights-of-way. The categories were divided into avoidance, constraint, and opportunity features, and the constraint features were then weighted for environmental impact potential. An environmental screening analysis using the computerized Geographical Information System (GIS) was then performed. The analysis involved applying the GIS overlay process to the various constraint data categories to produce a composite constraint map of the study area. The composite constraint map, color coded for various levels of constraint to corridor siting, was subsequently used as a guide for the selection of a series of alternative corridors. By means of a further application of GIS procedures, the corridor alternatives were statistically analyzed for adherence to corridor selection guidelines. In addition, a supplementary analysis was performed to compare the alternatives in terms of four impact categories: road crossings, construction costs, degree of land disruption, and population impact. The statistical and supplementary impact analyses led to a preliminary selection of a preferred corridor. The corridor assessment process indicated the importance of analyzing alternative trade-offs, as well as the need for more detailed investigation of certain conditions and a detailed comparison of alternatives prior to final corridor siting.

15488 **(DOE/WIPP—86-006) 1986 annual water quality data report for the Waste Isolation Pilot Plant.** Uhland, D.W.; Randall, W.S. (I. T. Corp., Carlsbad, NM (USA); Westinghouse Electric Corp., Carlsbad, NM (USA). Technology Development Dept.). Sep 1986. Contract AC04-86AL31950. 408p. NTIS, PC A18/MF A01; 1; GPO Dep. File Number DE87005590.

The Waste Isolation Pilot Plant (WIPP), a Department of Energy facility located in southeastern New Mexico, is designed to demonstrate the safe disposal of transuranic radioactive waste. The Water Quality Sampling Program (WQSP) supports four major programs for the WIPP: site characterization activities, Radiological Baseline, Ecological Monitoring and performance assessment. Results from 22 wells sampled from January 1985 through April 1986 under the WQSP are presented. Water quality data from four water-bearing zones have been collected. These zones are the Culebra and Magenta Dolomite Members of the Rustler Formation, the Dewey Lake Red Beds and the Hays sandstone member of the Bell Canyon Formation. Results from the sampling include field chemistry data as well as general water quality parameters, trace metals, and priority pollutants. The salinity of the Culebra Member of the Rustler Formation varies significantly over the area. The chloride concentration ranges from thirty to over a hundred thousand parts per million. This report summarizes the first of several samplings that will define the pre-operational water quality data base for WIPP project.

0540 Health And Safety

REFER ALSO TO CITATION(S) 16011, 16117, 16598, 16769, 16914

15489 **(CEA-DAS—219) Validation study of the intertran model for assessing risks of transportation accidents: Road transport of uranium hexafluoride.** Tomachevsky, E.G.; Ringot, C.; Pages, P.; Hubert, P. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France).. Dept. d'Analyse de Surete). Jun 1985. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750554.

The INTERTRAN code was developed by the IAEA in order to provide member states with a simple and rapid method of assessing the risk involved in the transportation of radioactive materials and one which was applicable on a worldwide scale. Before being used, this code must be validated and the CEA thus compared the results obtained with the conventional risk assessment methods used by the CEPN with those derived from INTERTRAN. This paper gives the results of the studies made on the subject of road transportation of uranium hexafluoride in France. The conventional accident risk assessment method gave a figure of 8.84 x 10^{-4} deaths/year, whereas INTERTRAN announces 1.78 x 10^{-3}. To these figures should be added 3.38 x 10^{-3} deaths/year, which is the intrinsic road risk, whatever the goods carried. In relation to conventional estimates, the INTERTRAN forecasts are five times lower for the U risk and twenty times higher for the HF risk. The chemical risk is indeed the most prevalent one in this case. Other comparisons are needed to validate this code.

15490 (CONF-860203—, pp 1-8) **Development of residual radioactivity criteria.** Lichtman, S.; Ronca-Battista, M. (Environmental Protection Agency, Washington, DC). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The US Environmental Protection Agency (EPA) is developing public health radiation protection criteria for residual radioactivity following cleanup of contaminated lands and facilities. Satisfaction of the criteria will allow the site to be safely released from all controls based on radioactivity. The criteria may be issued as broad Federal guidance, specific environmental standards, or both. The criteria will apply to sites owned or used by licensees of the Nuclear Regulatory Commission or its Agreement States, the Department of Energy, the Department of Defense, the former Atomic Energy Commission and Manhattan Engineering District, and where naturally-occurring or accelerator-produced materials have been used. The EPA is supporting the development of this project with the following activities. First, an inventory of never licensed or otherwise poorly documented sites is being compiled in conjunction with the National Conference of Radiation Control Program Directors, to ensure that the criteria are appropriate for all site types and satisfy existing and future decommissioning needs. Second, the relationship between residual radioactivity and public exposures under a variety of site and future use conditions is being studied. This information will enable EPA to evaluate the health impacts of alternative levels of residual radioactivity. Finally, nontechnical issues to be resolved include how the criteria and the supporting analyses could apply to recycled materials, how these criteria will relate to below regulatory concern wastes, and whether the criteria should include limits on planned reliance on institutional controls.

15491 (CONF-860203—, pp 9-18) **National and international considerations of a de minimis dose.** Kocher, D.C. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

This paper reviews current efforts by national and international agencies to establish a generally applicable de minimis radiation dose. A de minimis dose is derived from a level of risk that is widely regarded as negligible by the general public, and defines a level below which control of radiation exposures would be deliberately and specifically curtailed. A de minimis dose can be used to derive quantities of radionuclides in various materials that would be exempt or below regulatory concern for such purposes as resale, recycling, or disposal. The specification of exempt levels of radioactivity could lead to significant reductions in the required capacity of radioactive waste storage and disposal facilities and in the costs associated with management of slightly contaminated materials. A de minimis dose must be set well below the limit on acceptable dose for public exposures. A de minimis dose in the range 0.1-30 mrem (0.001-0.3 mSv) per year committed effective dose equivalent has been considered by various agencies, with most recommendations at 1 or 5 mrem per year. A value of 30 mrem per year may be too high for a de minimis dose, because a dose limit of 25 mrem per year is widely used in the US for regulating specific practices (e.g., low-level waste disposal). A value as low as 0.1 mrem per year could lead to great difficulties in measuring associated levels of radioactivity. They propose a de minimis dose of 1 mrem (0.01 mSv) per year committed effective dose equivalent averaged over a lifetime and 5 mrem (0.05 mSv) in any year. These values are 1% of the limits on acceptable dose from all sources of exposure that recently have been proposed by the National Council on Radiation Protection and Measurements. The proposed de minimis dose corresponds to a lifetime risk from continuous exposure of about 10^{-5}.

15492 (CONF-860203—, pp 19-26) **Allowable residual contamination levels for decommissioning: revisions to the method.** Kennedy, W.E. Jr.; Napier, B.A. (Pacific Northwest Lab., Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In 1983, Pacific Northwest Laboratory published a series of reports that describe the Allowable Residual Contamination Level (ARCL) method for decommissioning US Department of Energy (DOE) nuclear facilities and sites. The purpose of the method was to provide engineers with a useful tool for conducting safety and cost comparisons for decommissioning alternatives. The ARCL results are based on a scenario/exposure-pathway analysis and compliance with an annual radiation dose limit. Recently, revisions were made to the method that are designed to make it more useful for site- or facility-specific model applications. These revisions include analysis of additional exposure scenarios and pathways, the addition of area/volume correction factors to account for small areas or volumes of residual contamination, and an evaluation of barrier and waste-form credit factors to be applied in the analysis. This paper contains a description of the area/volume correction factors that are intended to permit the model to account for small areas or volumes of residual contamination.

15493 (CONF-860203—, pp 27-36) **Dose guidelines for decontamination and decommissioning projects.** Voilleque, P.G. (Science Applications International Corp., Idaho Falls, ID). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Dose guidelines are needed for evaluations of the potential exposure of members of the public to residual radioactivity following decontamination and decommissioning (D & D). These are then translated into guidelines for radionuclide concentration in media of interest, such as soil, using scenarios that define potential exposure pathways. The scenarios consider individuals whose location and behavior cause them to receive doses higher than the average person. These persons form the critical groups for radiation exposure following D & D activities. Two dose guidelines were developed. The higher annual dose guideline (D, mrem) defines an action level. If the projected annual dose (H, mrem) exceeds D, then action to reduce the potential dose is required. The lower annual dose guideline (DD, mrem) defines a no-action level. Projected doses below this level are trifling and of no regulatory concern. Selection of the two dose guidelines was based upon a review of existing national and international guidance. The effective dose equivalent was judged to be the appropriate dosimetric quantity. The selected value of D is 100 mrem, corresponding to a risk of about 10^{-5} per year. The selected value of DD is 1 mrem, carrying a risk of about 10^{-7} per year. It is emphasized that DD is not a goal or target for D & D activities, but a no-action level. For projected doses in the range DD < H < D, the ALARA principle applies. The cost and feasibility of clean-up as well as the benefits must be evaluated to determine the ALARA endpoint for a particular action.

15494 (CONF-860203—, pp 37) **Manual for implementing residual radioactivity guidelines.** Gilbert, T.L.; Eckerman, K.F.; Hansen, W.R.; Healy, J.W.; Kennedy, W.E.; Napier, B.A.; Solday, J.K. (Argonne National Lab., IL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The US Department of Energy (DOE) has recently issued guidelines for residual radioactivity at Formerly Utilized Sites Remedial Action Program (FUSRAP) and remote Surplus Facilities Management Program (SFMP) sites. A manual for implementing these guidelines has been prepared jointly by four DOE laboratories (ANL, LANL, ORNL, and PNL) and is being issued as a supplement to the guidelines. The manual presents procedures and tables for deriving site-specific guidelines for levels of residual radionuclide concentrations in soil that must not be exceeded if a site is to be released for unrestricted use. Guidance for implementing DOE ALARA policy for remedial actions is also included. The concentration factor method is used in the pathway analysis for deriving soil guidelines. The analysis has been structured in a manner that explicitly identifies all of the factors involved. Tables are provided for dose-conversion factors and pathway factors from which environmental transport factors for each radionuclide and pathway may be calculated. The scenarios used for deriving the environmental transport factors and dose conversion factors, and the manner in which the information provided in the manual is used to derive site-specific soil guidelines will be presented.

15495 (CONF-860203—, pp 39-50) **Residual surface contamination limits: problems in interpretation and implementation.** Wynveen, R.A.; Moe, H.J. Robinet, M.J.; Veluri, V.R. (Argonne National Lab., IL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

During the decontamination and decommissioning of facilities requiring remedial action, one is often faced with making decisions for the disposition of materials and equipment having various levels of residual surface radioactive contamination. The existing limits for the release of materials and equipment with such surface contamination have evolved historically from the proposed ANSI Standard N328, and U.S.N.R.C. Regulatory Guide 1.86. Experience gained by the Health Physics Group at Argonne National Laboratory in decommissioning a number of varied facilities has revealed several difficulties in the interpretation and implementation of these limits. Included in these difficulties are: (i) interpretation of these limits with respect to certain radionuclides and radionuclide chains, (ii) apparent inconsistencies in the assignment of certain radionuclides to a given hazard group, (iii) limited guidance in the treatment of contaminated material and equipment containing contributions from several radionuclides, and (iv) implementation problems in the interpretation of instrument readings, particularly when the contamination level is at or near the instrument detection limit. These and other problems are addressed from the standpoint of practical field applications. In addition, certain suggested modifications, designed to remove inconsistencies in the limits, are presented.

15496 (CONF-860203—, pp 51) **Decision making during radiological designation surveys.** Eng, J. (New Jersey Dept. of Environmental Protection, Trenton). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Investigations to identify contaminated sites are often performed under intense public scrutiny. Local officials, property owners and the general public seek assessments in time frames much shorter than investigators may consider sufficient to fully understand a problem. The designation survey is a critical factor in the entire remedial action program. Overly conservative designation processes can lead to many more properties requiring detailed characterization and possible economic and legal consequences. On the other hand, a cursory designation process may lead to too few properties and a premature judgement concerning the existence and extent of contamination with possible economic and legal consequences. Remedial action and investigative agencies need to evaluate their designation survey procedures. As an illustration, several New Jersey sites will be reviewed in terms of the approach various federal and state agencies have taken in the initial identification and designation processes.

15497 (CONF-860203—, pp 53-62) **UMTRA consent form acquisition: a survey of nonrespondents.** Gonsalves, L.L.; Carpenter, D.; Borak, T.B.; Kearney, P. (Colorado State Univ., Fort Collins). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Radiological Survey Activities group of the Health and Safety Research Division at Oak Ridge National Laboratory is the Inclusion Survey Contractor (ISC) for the Uranium Mill Tailings Remedial Action (UMTRA) project in Grand Junction, Colorado. The ISC is responsible for performing any required radiological surveys and data analyses for the recommendation of inclusion or exclusion of designated properties in the UMTRA project. One of the responsibilities of the ISC is to obtain consent from the property owners to conduct radiological surveys. In Grand Junction, Colorado 30-40% of the owners of designated properties have not responded to the consent-for-access requests sent by certified mail. A questionnaire was designed to identify and study this nonresponse through personal interviews with 100 randomly selected nonrespondents. A profile of the population of nonrespondents, reasons for nonresponse, as well as suggestions to encourage response were identified and analyzed.

15498 (CONF-860203—, pp 63-68) **Health physics program for the Edgemont Uranium Mill decommissioning project.** Polehn, J.L.; Wallace, R.G.; Reed, R.P.; Wilson, G.T. (Tennessee Valley Authority, Chattanooga). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Tennessee Valley Authority (TVA) is actively involved in decommissioning a uranium mill located near the town of Edgemont, South Dakota. The Edgemont Mill Decommissioning

Project, which is unique in many respects, will involve dismantlement of the old inactive mill building and excavation and transportation of several million tons of uranium mill tailings to a permanent disposal site. To ensure that workers are adequately protected from radiation exposure during decommissioning operations, a health physics program appropriate for the decommissioning situation was developed. The Edgemont Mill Decommissioning Project Health Physics Manual (HPM) gives the programmatic requirements for worker radiation protection. The requirements of the HPM are implemented by means of detailed onsite operating procedures. The Edgemont project health physics program was developed using currently available regulations and guidance for an operating uranium mill with appropriate modifications for decommissioning. This paper discusses the development, implementation, and documentation of that program.

15499 (CONF-860203—, pp 79) **Industrial safety and health physics interactions during slurry transfer of 1000 curies of radium residues at the Niagara Falls Storage Site (NFSS).** Williams, P.A. (Bechtel National, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Bechtel National, Inc. performed radiological decontamination operations on the Niagara Falls Storage Site in Lewiston, New York. A primary activity was the hydraulic transfer of 3000 cubic yards of highly contaminated radium residues from the 160′ tall K-65 Tower, approximately 5000′ across the site to an engineered storage facility. The industrial safety hazards associated with the residue transfer were unique and involved the constant coordination of radiological controls and personal safety constraints for personnel working 160′ above ground level. Safety was of paramount importance for the life-threatening confined space entries, 160′ fall potential, approximately 5000 mancage trips, 2.5 million cubic feet of breathing air supplied, heat stress concerns, and implementation of emergency rescue provisions with subcontractor personnel and local fire-rescue agencies. The methods and techniques of the planning, operational monitoring, and enforcement of the safety controls during this radiological cleanup operation will be presented. Emphasis will be directed to problem areas and solutions that can be applied to similar radiological operations.

15500 (CONF-860203—, pp 81-88) **Health physics experience during a uranium and thorium pond closure.** Cole, L.W.; Prewett, S.V. (Aerojet Heavy Metals Co., Jonesborough, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Aerojet Heavy Metals Company (AHMC) recently completed a pond decommissioning project which involved the movement and interment of approximately 600,000 cubic feet of uranium- and thorium-contaminated soil. This work was performed by a construction company using standard earth moving equipment and their general labor force. In addition to the construction company employees, geotechnical quality assurance was performed by a soils test engineer and overall construction management was performed by a resident project engineer. Certification of cleanup and inventory sampling were done by contract personnel also. In general, a large complicated project involving several different parties, a large amount of equipment and a large work area was completed with minimal exposure and no spread of contamination to uncontrolled areas. Detailed pre-planning with the project management staff and careful coordination with the actual construction contractor is required. Predictive methods of contamination and air activities can be valuable in assessing the program requirements.

15501 (CONF-860203—, pp 89-94) **Overview of decommissioning and decontamination technical information support activities funded by the U.S. Department of Energy's remedial action programs.** Owen, P.T. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In 1979 the US Department of Energy (DOE) established the Remedial Action Program Information Center (RAPIC) at the Oak Ridge National Laboratory to provide technical information support to the Surplus Facilities Management Program, DOE's national decommissioning and decontamination (D & D) program which is managed by DOE's Richland Operations Office and UNC Nuclear Industries, Inc., and to the other DOE remedial action programs. Specific information activities that RAPIC performs to support the DOE's programs and the D & D community include: maintaining a computerized bibliographic database containing about 4500 annotated citations (about 2000 on D & D) and a database of 1800 contacts involved with remedial action work at radioactively contaminated sites; publishing an annual bibliography, Nuclear Facility Decommissioning and Site Remedial Actions, A Selected Bibliography, ORNL/EIS-154 (six volumes published); maintaining a document repository and providing copies of requested publications; and performing manual and computerized searches of the technical literature. The most significant RAPIC function is serving as a focal point for D & D information. With the extensive resources at its command, RAPIC is in a unique position to provide a comprehensive information base to the D & D community. DOE makes these services available to foster good public relations and promote cooperation and information exchange.

15502 (CONF-860203—, pp 95-103) **Decommissioning planning and the assessment of alternatives for the Hanford production reactors.** Miller, C.E.; Potter, R.F.; Chattin, J.C. (Dept. of Energy, Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The US Department of Energy Hanford Site, near Richland, Washington, is the location of eight shut-down plutonium production reactors that are now in safe storage. These reactors each operated between 14 and 24 years, until shutdown of the last reactor in 1971. Comprehensive decommissioning planning has been conducted for the reactors and their support facilities actual decommissioning work has begun on some support facilities. Decommissioning criteria used at Hanford are discussed in this paper, as well as major planning assumptions. Decommissioning alternatives have been identified and assessed. The final decommissioning alternative will be selected through the National Environmental Policy Act (NEPA) process. The NEPA process for the Hanford reactor decommissioning has been initiated and will include a complete Environmental Impact Statement.

15503 (CONF-860203—, pp 105-113) **Environmental assessment relating to the decommissioning of Strontium Semiworks facility.** Hale, V.Q.; Speer, D.R. (Rockwell Hanford Operations, Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC06-77RL01030.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Strontium Semiworks complex on the Hanford Site was a pilot plant for radioisotope separation processes. The Strontium Semiworks facility was operated from 1949 to 1967 at which time it was retired and has been maintained in safe storage since then. The conditions of the building, the cost of safe storage, and the potential for radioisotope release lead to a decision in 1983 to decommission the facilities. The decommissioning alternatives considered were (1) earthen entombment without demolition, (2) partial dismantlement/entombment, (3) razing of all above ground structures, (4) total dismantlement, and (5) no action. An Environmental Assessment for the project was prepared in 1984 and a Finding of No Significant Impact issued on May 15, 1985. The approved method for decommissioning was Alternative 2 based on stability of the end product, cost of the project and projected impacts.

15504 (CONF-860203—, pp 115-124) **Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology.** Fields, D.E. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The PRESTO-II methodology may be applied to evaluate doses and health risks from a variety of decontamination and decommissioning activities. This methodology has been implemented in the form of a computer code that has been applied to several sites, and that has been extensively documented. Radionuclide inventories are specified as separate contamination sources either present on the ground surface, covered by non-radioactive soils but lying above the water table, suspended in the atmosphere, or dissolved in surface waters. Hydrologic transport mechanisms considered in the PRESTO-II methodology include chemical exchange, ponding and overflow, surface water transport, groundwater transport, and pumping contaminated groundwater from wells. Varied scenarios of water usage are treated. Atmospheric inputs are based on both resuspension factor and resuspension rate approaches, with inhalation and immersion doses based on a Gaussian plume transport calculation. Site activities that are considered include land clearing, farming, and residing on the site. Exposure and dose calculations are derived from the US Nuclear Regulatory Commission Reg. Guide 1.109 approach, while risk calculations use a life-table approach developed for the US Environmental Protection Agency (EPA). Internal dose conversion factors are taken from ICRP 26 and 30, while risk conversion factors are values suggested by EPA.

15505 (CONF-860203—, pp 125-133) **Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS.** Miller, C.W.; Sjoreen, A.L.; Cotter, S.J. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Computerized Radiological Risk Investigation System (CRRIS) is applicable to determining doses and risks from a variety of decontamination and decommissioning activities. For example, concentrations in air from resuspended radionuclides initially deposited on the ground surface and the concentrations of deposited radionuclides in various soil layers can be obtained. The CRRIS will estimate exposure to radon and its progeny in terms of working-level months, and will compute the resulting health risks. The CRRIS consists of seven integrated computer codes that stand alone or are run as a system to calculate environmental transport, doses, and risks. PRIMUS output provides other CRRIS codes the capability to handle radionuclide decay chains. ANEMOS and RETADD-II calculate atmospheric dispersion and deposition for local and regional distances, respectively. Multiple ANEMOS runs for sources within a small area are combined on a master grid by SUMIT. MLSOIL is used to estimate effective ground surface concentrations for dose computations. TERRA calculates foodchain transport, and ANDROS calculates individual or population exposures, doses, and risks. Applications of the CRRIS to decontamination problems are discussed.

15506 (CONF-860203—, pp 135-142) **Composite empirical and analytical method to predict the magnitude of surface contamination in semi-accessible areas.** Distenfeld, C.H.; Vallem, R.J. (GPU Nuclear Corp., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The purpose of this study was to develop an exposure rate model for the radiation fields within the lower portion of the A D-ring in the Three Mile Island Unit 2 (TMI-2) reactor building (RB) containment. The model was based on vertical strings of thermoluminescent dosimeter (TLD) measurements made adjacent to the steam generator. The measurements were made with standard Panasonic personnel dosimeters assembled on plastic strips to produce TLD strings. The dosimeters were vertically spaced about 30 cm apart. The TLD strings were lowered about 7.8 meters from the elevation 308' platform to the elevation 282.5' basement floor. The string were placed midway between the vertical axis of the steam generator and cold legs. About 3 meters above the basement floor the string passed a metal platform that had been submerged in primary coolant released during the accident. Six discrete surface sources were mathematically modeled to closely correspond to the surfaces that exposed the TLD strings. The models used were a disc geometry for the concrete floor; vertical surface cylinders for the cold legs and steam generator; a horizontal surface cylinder for the J connection between the cold legs and steam generator; a rectangular surface geometry for the platforms; and a constant term to account for unmodeled sources. The six models were used to calculate responses corresponding to the TLD locations. This resulted in a matrix of 15 equations with six unknowns. An iterative method requiring best positive solutions was used to solve the overspecified set simultaneously. The results indicate that the surface activity varies from 5E9 to 6E11 Bq/m^3 (14 to 1670 μCi/cm^3).

15507 (CONF-860203—, pp 143-150) **Implementation of decommissioning criteria in the conceptual design of the MRS facility.** Gross, D.L.; Wilcox, A.D.; Huang, S. (Ralph M. Parsons Co., Pasadena, CA). Dec 1986. NTIS $23.00. File Number DE86900357. (CONF-860203—). Contract AC06-84RL10436.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The US Department of Energy (DOE) selected the Ralph M. Parsons Company (RMP) to prepare the conceptual design of the Monitored Retrievable Storage (MRS) Facility. The purpose of this facility is to consolidate and temporarily store spent fuel from civilian nuclear power plants. In addition, it will overpack, handle, and store high-level radioactive waste from non-defense related sources. The Functional Design Criteria (FDC) prepared by Pacific Northwest Laboratories, as well as 10 CFR 72, requires the facility to be designed for decommissioning, with provisions to facilitate decontamination of structures and equipment to minimize the volume of radioactive wastes and contaminated equipment at the time of decommissioning. Many problems associated with decommissioning a nuclear facility have been identified in recent years and the design for the MRS Facility presents a unique opportunity for RMP to implement decommissioning criteria into the conceptual design of a major nuclear facility. The provisions made in the design to facilitate decommissioning include good housekeeping during operations, controlled personnel access, access for equipment removal, equipment design, installed radiation monitors, adequate work space, installed decontamination systems and areas, control of all effluents, and operational documentation. These topics will be the major points of discussion for this paper.

15508 (CONF-860203—, pp 151-160) **Simplified pathway analysis approach for establishing limits for soil contamination.** Till, J.E.; Whittaker, M.S.; Moore, R.E. (Radiological Assessment Corp., Neeses, SC). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Release from a byproduct material license requires demonstration that radioactive contamination has been removed to the extent practicable. An approach requiring only minimal data inputs was developed which accounts for the potential pathways of exposure from soil contamination and yields a conservative estimate of the annual dose. A limit for soil contamination meeting the extent practicable requirement can then be calculated by assuming an annual dose limit. A soil contamination limit, developed by this method, was applied by Chem-Nuclear Systems, Inc. to the decommissioning of an irradiation facility and was accepted by the NRC.

15509 (CONF-860203—, pp 161-170) **Legal and ethical issues raised in considering residential decontamination options for technologically-enhanced radioactive contamination.** Jensen, L.; Feldman, J. (Environmental Protection Agency, Chicago, IL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

A large number of residential and commercial properties have been identified as having radioactive contamination resulting from disposal of radioactive residues from ore extraction operations, usually radium, thorium or uranium. The US Department of Energy has addressed many of the sites associated with the Manhattan Project through its FUSRAP program. But now, the US Environmental Protection Agency is faced with removal of residues from other operations under its Superfund program. High removal and disposal costs are often difficult to balance against the comparatively low value of properties affected. Soil screening techniques must be rapid and present a relatively high level of assurance that criteria are not exceeded. Yet, private lives are affected. Considerations in making cost-benefit decisions are discussed here.

15510 (CONF-860203—, pp 171-179) **Public information experience in the uranium mill tailings remedial action (UMTRA) project.** Meyer, H.R.; Skinner, D.J. (Chem-Nuclear Systems, Inc., Albuquerque, NM). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

To enhance public perception of the UMTRA Project remedial actions at some 23 sites in the US, an information program has been designed to demonstrate the small risk associated with the work in each community. An unusual aspect of this information program has involved a specific effort to educate listeners concerning the Health Physics terminology being used. The information program has been successful in reducing the level of public anxiety associated with UMTRA remedial action at the first Project site, and is currently being applied at several new sites.

15511 (CONF-860203—, pp 181-190) **Financial assurance for decontamination and decommissioning: a Texas perspective.** Rao, C.D.; Etter, S.D.; Dziuk, T.W. (Texas Dept. of Health, Austin). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Texas Department of Health (TDH) has the regulatory responsibility to ensure that funds are available for decontamination, decommissioning, and reclamation of uranium recovery facilities in Texas. Uranium recovery licensees are required to post financial security with the Agency for that purpose. Texas uranium facilities include (1) conventional surface mining and milling plants, including tailings ponds, and (2) in situ solution mining plants, each with somewhat different cost elements for decontamination, decommissioning, reclamation, and closure. Cost estimates for decontamination, decommissioning, and reclamation, along with a facility closure plan, are initially submitted to the Agency by the licensees. These are verified and compared with detailed independent cost estimates prepared by Agency staff. Significant differences between the two estimates are examined and resolved by negotiation and/or recalculation to the satisfaction of the state. The Texas philosophy for maintaining financial security permits flexibility in the closure plan without jeopardizing or compromising the ultimate long-term objectives of closure. Review of closure plans incorporates new technological developments In contrast, financial security is established expeditiously by applying the best available cost data to necessarily conservative estimates of the work involved. Financial security cost estimates are subject to annual review and adjustment.

15512 (CONF-860203—, pp 191-195) **Use of site groundwater investigations in the decontamination and decommissioning of nuclear facilities.** Molello, S.A. (GPU Nuclear Corp., Forked River, NJ). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

A major component of the environmental analysis process during the decontamination and decommissioning of nuclear facilities is the assessment of the subsurface for radiological contamination. The maximum value for efforts and dollars expended during such assessments is achieved when the site groundwater investigation is conducted in a carefully planned and systematic manner. Guidelines and instructions for the accomplishment of these investigations are presented, including: (1) an introduction explaining the needs for and uses of such investigations, (2) a step by step explanation of a desirable format for the design of site groundwater investigation work plans, and (3) the utilization of data obtained in the implementation of remedial or corrective actions, if necessary. Several topics related to these three areas are also discussed, including public relations and litigation.

15513 (CONF-860203—, pp 197) **Comparisons of passive environmental radon monitors (PERMs) and track etch (R) radon detectors during remedial actions at the Niagara Falls Storage Site.** Borden, W.C.; Kaye, M.E. (Bechtel National, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

During recent remedial actions for the US Department of Energy at its Niagara Falls Storage Site, in excess of 6000 curies of radioactive materials (thorium-230 and radium-226 in equilibrium with its particulate daughters) were slurry transferred approximately one mile to an engineered waste storage facility. During this transfer, radon-222 was released to the atmosphere. Off-site concentrations of radon-222 were monitored throughout a year's period with 30 PERM and 29 Track Etch (R) detectors. Of these 59 monitoring devices, 38 were arranged as paired stations providing 266 data points for comparative assessments. Detailed attention is given to environmental and topographical conditions that significantly effect detector performance, and that are unique to the northeastern US. Experimental data is presented that quantifies effects of climate changes, as well as detector response and integration capabilities. Conclusions point to the need for significant programmatic and siting changes.

15514 (CONF-860203—, pp 199-209) **Environmental monitoring requirements during remedial action and stabilization of uranium mill tailings (UMTRA project).** Skinner, D.J.; Meyer, H.R.; Hoffman, L.G. (Chem-Nuclear Systems, Inc., Albuquerque, NM). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Department of Energy is conducting remedial action at uranium mill sites which supplied uranium to the US government under the Manhattan Project. There are requirements to conduct an environmental monitoring program during actual remedial action. The purpose of the environmental monitoring program is to provide information and assurance to the DOE and the public that environmental releases, due to remedial action activities, are within applicable regulations and guidelines. A discussion of the generic program requirements including: radon monitoring, radionuclide particulate monitoring, water monitoring and environmental gamma dose assessment are reviewed. Specific results for the Canonsburg, PA and Shiprock, NM UMTRA sites, are briefly presented.

15515 (CONF-860203—, pp 211-216) **Radiological characterization of the Weldon Spring Quarry Weldon Spring, Missouri.** Hickey, C.R.; Glenn, R.D.; Christian, K.L. (Bechtel National, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Bechtel National, Inc., performed a radiological survey of the Weldon Spring Quarry (WSQ), Weldon Spring, Missouri in

1984 and 1985 as part of the US Department of Energy's Surplus Facilities Management Program. The WSQ is a 9-acre site that is presently used for storage of low-level radioactively contaminated soils, rubble, and equipment. The WSQ received these thorium-, radium-, and uranium-contaminated materials including rubble, equipment, and soils from 1959 to 1968. This survey consisted of beta-gamma and gamma measurements made at the ground surface, external gamma and radon rate measurements, and subsurface gamma loggings. In addition, surface and subsurface soils, surface water, groundwater, and sediment samples were collected and analyzed for thorium-230 and -232; radium-226, and -228; uranium-234, -235, and -238; and lead-210. Analyses of samples indicated concentrations of thorium-230, and -232; radium-226; and uranium-234, -235, and -238 in excess of the US Department of Energy remedial action guidelines. Several problems were encountered during this survey, including surveying on rough terrain, drilling into rubble, and severe weather conditions. This paper discusses the monitoring equipment and procedures used during the survey. In addition, solutions to several problems encountered will be described.

15516 (CONF-860203—, pp 217-225) **Environmental impacts of the release of a transuranic actinide, americium-241, from a contaminated facility.** Wang, J.; Merry-Libby, P. (Argonne National Lab., IL). Dec 1986. NTIS $23.00. File Number DE86900357. Contract W-31-109-ENG-38.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Americium-241 is widely used as a radiation source, but it also has some potential risk if taken into the body because of its high dose conversion factor. Although the radiotoxicity of americium-241 is small compared to other transuranic actinides, its effects on the reproductive system and on development of the placenta are more damaging than the effects of plutonium-239. In Ohio, a gemologist's laboratory was contaminated with americium-241. Prior to decontamination of the laboratory, potential radiological impacts to the surrounding environment were assessed. A hypothetical fire accident resulting in a unit release (1 curie) was assumed. Potential radiological impacts were simulated using an atmospheric dispersion and dosimetry model with local meteorological data, population census data, and detailed information regarding the neighborhood. The results indicate that there could have been a significant impact on nearby residents from americium-241 via atmospheric dispersion if a major catastrophic release had occurred prior to decontamination and decommissioning of the laboratory.

15517 (CONF-860203—, pp 227) **Review of current research into soil decontamination and volume reduction techniques for purposes of transportation and disposal.** Haywood, F.F. (Eberline Analytical Corp., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In recent years, a number of soil decontamination studies have been carried out by investigators in the US and Canada. These investigations have included the segregation of potentially hazardous chemicals from uranium mill tailings, the use of various leaching agents for the selective removal of radium, thorium, and uranium from mine and mill tailings, the study of neutralization, fixation, and conditioning processes for tailings, the separation and removal of transuranium elements from contaminated soil and sediment, and finally studies of the cost effectiveness of various decontamination approaches. Remedial action programs for which soil decontamination may be an attractive alternative are those which include the cleanup of large open land areas since thousands of cubic years of material are generally involved. The practice of decontaminating or otherwise segregating contaminated and uncontaminated soil fractions before shipment to a final disposal site can only be done if it is economical to do so. This paper considers several techniques which have been reported in unclassified literature and includes a comparison of the authors' conclusions regarding the effectiveness of their investigations. The manuscript will include a comprehensive bibliography of references to techniques which appear to be feasible alternatives in remedial action programs.

15518 (CONF-860203—, pp 229-233) **TMI-2 post-accident dose reduction through coating removal.** Hinds, S.S.; Pavelek, M.D. II; Hoyt, K.R. (Bechtel National, Inc., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

This paper describes the approaches used to define sources and to achieve both effective decontamination and dose reduction through coating removal from surfaces in the TMI-2 auxiliary and fuel handling building and reactor building. The testing, production rates, and lessons learned during surface removal operations from 30,000 ft^2 of epoxy coated concrete floors are discussed. Finally, the resulting post-decontamination exposure levels and recommendations for future work are presented.

15519 (CONF-860203—, pp 235-239) **Use of urethane foam in the decontamination and decommissioning of nuclear facilities.** Hermetz, R.E. (Monsanto Research Corp., Miamisburg, OH). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC04-76DP00053.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Urethane foam is being used in decontamination and decommissioning work in radioactively contaminated areas at Monsanto Research Corporation's Mound facility. Used in a two-step method, the foam is first sprayed onto the interior surfaces of contaminated gloveboxes, fixing residual contamination beneath the urethane. The foam is then used to package and stabilize gloveboxes inside standard transuranic shipping containers. The procedure reduces health and safety risks and has proven cost effective.

15520 (CONF-860203—, pp 241-250) **Remote methods for decontamination and decommissioning operations.** DeVore, J.R. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Three methods for the decontamination and decommissioning of nuclear facilities are described along with operational experience associated with each method. Each method described in some way reduces radiation exposure to the operating personnel involved. Electrochemical decontamination of process tanks is described using an in-situ method. Descriptions of two processes, electropolishing and cerium redox decontamination, are listed. A method of essentially smokeless cutting of process piping using a plasma-arc cutting torch is described. In one technique, piping is cut remotely from a distance using a specially modified torch holder. In another technique, cutting is done with master-slave manipulators inside a hot cell. Finally, a method for remote cutting and scarification of contaminated concrete is described. This system, which utilizes high-pressure water jets, is coupled to a cutting head or rotating scarification head. The system is suited for cutting contaminated concrete for removal or removing a thin layer in a controlled manner for decontamination.

15521 (CONF-860203—, pp 251) **Johnston Atoll site cleanup - some practical concerns.** Vesper, B.E.; Mohaupt, T.H.; Dooley, M.A.; Bramlett, E. (Armed Forces Radiobiology Research Institute, Bethesda, MD). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Johnston Island in the Pacific Ocean was contaminated as a result of weapons testing in the early 1960's. A recent cleanup project removed approximately 540 tons of actinide contaminated debris from a missile launch site. The site removal effort consisted of monitoring all debris for contamination levels, fixing contamination in place and packaging materials to meet DOT regulations for both land and water transportation. This report presents details of

this recent practical project in site decontamination and details decommissioning of an actinide only contaminated site.

15522 (CONF-860203—, pp 271-291) **Decontamination and decommissioning of extraction cell 3 at the West Valley Demonstration Project.** Jones, E.D. (West Valley Nuclear Services Co., Inc., NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

This paper describes the decontamination and decommissioning (D/D) of Extraction Cell 3 (XC-3) at the West Valley Demonstration Project. XC-3 is one of several cells in the former reprocessing plant required for future use in support of the solidification of high-level waste. The cell became radioactively contaminated during nuclear fuel reprocessing from 1966 to 1972. This report describes the work performed to accomplish the D/D objectives of removing existing piping and equipment from XC-3 and of reducing radiation and contamination levels to allow installation of equipment for the Liquid Waste Treatment System (LWTS). Contaminated debris and equipment inside the cell were removed, packaged and stored for future disposition. Interior surfaces (walls, floor, and ceiling) of the cell were then decontaminated to a radiation level that allowed entry without the use of protective clothing or respiratory protection.

15523 (CONF-860203—, pp 293) **Deconning during the 1984 H.B. Robinson steam generator replacement project.** Meyer, B.A. (Carolina Power & Light Co., New Hill, NC). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In 1984 the H.B. Robinson Nuclear Plant replaced the nuclear supply system steam generators. Many deconning techniques and applications were used during this major year-long maintenance outage. Some of the deconning techniques used included an alumina grit blasting system; a high-temperature steam cleaning/vacuum cleaner an ultrasonic Freon degreaser; a sandblasting glove box; and soap, water, and elbow grease. Some of the specific deconning applications included the steam generator channel heads, the reactor refueling cavity, a variety of tools and equipment, and the complete general area of the reactor containment vessel. These and other deconning techniques and applications reduced the need for respiratory protection, reduced the exposure rates in work areas and, subsequently, workers' dose, decreased the personnel contamination events, and reduced the amount of radwaste generated.

15524 (CONF-860203—, pp 295) **Determination of U-238, Ra-226, and Th-232 by gamma-ray spectrometry in unprocessed soil samples.** Dendahl, K.H.; Brown, J.A. (Eberline Analytical Corp., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Following the excavation of open land areas during remedial action programs, it is frequently necessary to analyze soil samples which have not been processed. Typically, soil is placed in containers such as 0.5 liter plastic jars or 2 liter metal cans at the time it is collected. An analysis procedure for these samples has been developed with reference to counting standards in the same types of container. Information from the initial analysis is used in conjunction with near-surface in situ gamma-ray measurements over excavated areas to support the decision to backfill an area. Following this initial analysis, each sample is dried, pulverized and packed into a Marinelli beaker for final counting. A comparison of the results from both analyses shows the first analysis to be low by as much as a factor of 2. The principal reason for this effect is the presence of moisture in the original samples. The difference is most noticeable for low energy photons from Th-234 (U-238), at least for photons from Th-232 daughters. This paper will address the development of these techniques for analyses.

15525 (CONF-860203—, pp 297) **In situ monitoring technique for determining post remedial action concentrations of radium in soil.** Johnson, N.R.; Glenn, R.D. (Eberline Analytical Corp., Albuquerque, NM). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

There are several federal programs where action is being carried out to clean up or otherwise control residual radioactivity, at levels above current guidelines, which exists as a result of activities carried out during the early years of this nation's atomic energy program. At most of the sites which are candidates for clean up, the principal radionuclide of concern is Ra-226. Following excavation of open land areas, measuring the concentration of Ra-226 in soil samples from discrete locations or by indirect monitoring techniques. For application in remedial action programs, as in situ monitoring technique has been employed with favorable results. Instrumentation for this technique consists of a 2" x 2" NaI probe mounted on a wheeled dolly so that the detector is approximately 12" above the ground. Radiation levels are read out using a portable digital ratemeter/scaler. Readings with this device are representative of photons which reach the detector from a ground area subtended by projection of the cone shield side wall. This system was calibrated using facilities at the Department of Energy Technical Measurements Center, Grand Junction, CO. A series of measurements at this facility revealed a conversion factor which relates the response for Ra-226 in dry soil: Ra-226 $pCi/g = 1.06 \times 10^{-3}$ (cpm) - 2.94. The correlation coefficient was 0.99. This technique has been used extensively to predict the Ra-226 soil concentration averaged over individual 100 m^2 areas.

15526 (CONF-860203—, pp 301) **Radiological field survey problems & solutions.** Deming, E.J.; Boerner, A.J. (Oak Ridge Associated Universities, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Situations often arise during radiological field surveys which require the health physicist to improvise and/or make spot decisions. At times these situations can be humorous, but they can also present hazards more serious than normal radiological considerations. This presentation will depict various problematic situations encountered by Oak Ridge Associated Universities Radiological Site Assessment Program in the course of performing field environmental surveys. Detailing these potential hazards can alert other field survey groups to problems they may encounter.

15527 (CONF-860203—, pp 303-310) **Measurement of radon and radon progeny in radium contaminated residential properties in New Jersey.** Eng, J.; White, A.D.; Hopper, R. (New Jersey Dept. of Environmental Protection, Trenton). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

As part of a radiological investigation and remedial action program, 45 homes affected by radium contaminated soil were monitored quarterly since Fall 1983. Elevated levels of radon and radon progeny were found in homes built on former radium contaminated landfill areas. Radon progeny levels in excess of 0.1 Working Levels (WL) were lowered by installing ventilation systems in the basement. The remaining homes with radon progeny levels less than 0.1 WL were not remediated. Both sets of homes were monitored quarterly through 1985. Radon measurements were made over 3-5 days with the activated carbon canister manufactured by the NJ Department of Environmental Protection based on a US Department of Energy's Environmental Measurements Laboratory design. Radon progeny measurements were made over 5-7 days with the Radon Progeny Integrating Sampling Unit (RPISU) designed by the US Environmental Protection Agency. This paper will evaluate the impact of seasonal and home use factors on radon, radon progeny and equilibrium factor.

15528 (CONF-860203—, pp 321) **Johnston Atoll cleanup - accurate monitoring for actinides.** Vesper, B.E.; Mohaupt, T.H.; Dooley, M.A.; Bramlett, E. (Armed Forces Radiobiology Research Institute, Bethesda, MD). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

A recent cleanup of actinide contamination was conducted at a site on Johnston Island in the Pacific Ocean. Extensive effort was necessary to quantify specific nuclide concentrations and to determine the total actinide levels as required for shipment to a burial site. Initial monitoring of site debris was made with a FIDLER probe connected to a log-linear rate meter to roughly determine the host spots. Counting was then done for quantitative actinide levels via a high intrinsic Germanium detector combined with a multichannel analyzer. Isotopic analysis and actinide levels were then determined by feeding MCA data into a computer. This report reviews the approaches to some of the unique challenges encountered in this cleanup effort.

15529 (CONF-860203—, pp 331-337) **Radioactive waste assay at the West Valley Demonstration Project.** Marchetti, S.; McVay, C.W.; Stimmel, J.R. (West Valley Nuclear Services Co., Inc., NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The decontamination and decommissioning of the West Valley nuclear reprocessing plant is generating a large variety of types of radioactive waste which require classification in accordance with 10CFR61. A radioactive waste assay system has been developed to efficiently assay and classify this radioactive waste. The waste is assayed by segmented gamma counting, passive neutron counting, dose rate conversion, and/or laboratory analysis. The system is capable of handling all the waste from generated at the West Valley Demonstration Project. The system produces a list of nuclides present with their concentrations and determines the classification of the waste based on the criteria contained in 10 CFR 61.

15530 (CONF-860203—, pp 339-346) **Comparison of the response of a NaI scintillation crystal with a pressurized ionization chamber as a function of altitude, radiation level, and Ra-226 concentration.** Provencher, R.; Smith, G.; Borak, T.B.; Kearney, P. (Colorado State Univ., Fort Collins). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Grand Junction Uranium Mill Tailings Remedial Action-Radiological Survey Activities Group (UMTRA-RASA) program employs a screening method in which external exposure rates are used to determine if a property contaminated with uranium mill tailings is eligible for remedial action. Portable NaI detectors are used by survey technicians to locate contaminated areas and determine exposure rates. The exposure rate is calculated using a regression equation derived from paired measurements made with a pressurized ionization chamber (PIC) and a NaI detector. During July of 1985 extensive measurements were taken using a PIC and a NaI scintillator with both analogue and digital readout for a wide range of exposure rates and at a variety of elevations. The surface soil was sampled at most of these locations and analyzed for ^{226}Ra. The response of the NaI detectors was shown to be highly correlated to radiation level but not to ^{226}Ra concentration or elevation.

15531 (CONF-860203—, pp 347-358) **Using a HPGe detector and micro R meter for quick and simple estimate of radionuclide activity in LSA shipping containers.** Robinet, M.J.; Justus, A.L. Wynveen, R.A. (Argonne National Lab., IL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Shippers of low specific activity (LSA) waste are required by both waste receivers and Department of Transportation (DOT) regulations to provide an estimate of radionuclide activity in each container. In their work, a high resolution HPGe detector was used to measure the ^{226}Ra and daughters gamma flux from 90 ft^3 LSA waste containers. The detector was calibrated with a radium point source of known activity. To calculate the radium activity in a container, the gamma flux reaching the detector from successive slices of the container was numerically integrated over its dimensions. The counting time for each container initially required several hours. However, by constructing a graph of container radium activity versus average exposure rate (μR/h) at container surfaces, a measurement could be made in a few minutes and the activity read from the graph. Results are estimated to be accurate to at least an order of magnitude. Where hundreds of containers are involved, the time and cost saved by this technique can be significant.

15532 (CONF-860203—, pp 359-368) **Rapid estimation of ^{226}Ra in soil for the Grand Junction RASA/UMTRA Project.** Kark, J.B.; Borak, T.B.; Kearney, P.D.; Rood, A.S. (Colorado State Univ., Fort Collins). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Radiological Survey Activities (RASA) Group of the Health and Safety Research Division at Oak Ridge National Laboratory (ORNL) is an Inclusion Survey Contractor (ISC) for the Uranium Mill Tailings Remedial Action Program (UMTRAP). The purpose of the ISC is to survey designated sites potentially contaminated with radioactive material originating from the 24 inactive uranium mill sites and make recommendations as to whether the site should be included in or excluded from further consideration by UNTRAP. An important aspect of the program is a prompt and inexpensive estimation of Radium-226 (^{226}Ra) concentration in soil samples. A large sodium iodide (NaI) well crystal coupled to a multichannel analyzer is used to count soil samples. Count data are currently analyzed with an algorithm that utilizes three regions of interest (ROI). A lack of agreement was observed when samples were also analyzed with lithium-drifted germanium (GeLi) spectrometers. The average estimate of ^{226}Ra obtained using the current algorithm was 19% greater than the GeLi determination. Some possible reasons for these differences were examined. In 8.5% of the samples, the relative concentration of Cesium-137 (^{137}Cs) was highly correlated to the extent of error. Using alternative analysis techniques, the error for ^{226}Ra estimations may be reduced by a factor of 2 for randomly selected samples and by a factor of 4 for samples containing high concentrations of ^{137}Cs relative to the concentrations of ^{226}Ra.

15533 (CONF-860203—, pp 379-388) **Health physics experience in the decontamination and decommissioning of the 203-S, 204-S, and 205-S uranium nitrate hexahydrate purification and waste tank car unloading facilities.** Rasmussen, O.R. (Rockwell Hanford Operations, Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The obsolete 203-S, 204-S, and 205-S uranium nitrate hexahydrate purification and storage facility and the radioactive waste tank car unloading equipment in the 200 West Area of the US Department of Energy Hanford Site were decontaminated and decommissioned. Aboveground facilities were dismantled, and the area was backfilled with clean fill over underground concrete structures. The site was released as a radiologically clean area with underground contamination. The 13-month project was completed by Rockwell Hanford Operations decontamination and decommissioning forces three months ahead of schedule and $275,000 under budget. Important health physics aspects of the project included hydraulic sluicing of vessels to reduce radioactive material inventories, intact transport, fill and burial of large vessels to minimize hands-on dismantling, and the use of special containment techniques for pipe dismantling, including pipe drainage with explosive-activated tees, and pipe cutting and sealing with hydraulic crimping equipment.

15534 (CONF-860203—, pp 389-399) **Placement of the radiochemical processing plant at Oak Ridge National Laboratory into a safe standby condition.** Holladay, D.W.; Bopp, C.D.; Farmer, A.J.; Johnson, J.K.; Miller, C.H.; Powers, B.A.; Collins, E.D. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Extensive upgrade, cleanup, and decontamination efforts are being conducted for appropriate areas in the Radiochemical Processing Plant (RPP) with the goal of achieving safe standby condition by the end of FY 1989. The ventilation system must maintain containment thus, it is being upgraded via demolition and replacement of marginally adequate ductwork, fans, and control systems. Areas that are being decontaminated and stripped of various services (e.g., piping, ductwork, and process tanks) include hot cells, makeup rooms, and pipe tunnels. Operating equipment that is being decontaminated includes glove boxes and hoods. Replacement of the ventilation system and removal of equipment from pipe tunnels, cells, and makeup rooms are accomplished by contact labor by workers using proper attire, safety rules, and shielding, Removal of contaminated ductwork and piping is conducted with containment enclosures that are strategically located at breakpoints, and methods of separation are chosen to conform with health physics requirements. The methods of cutting contaminated piping and ductwork include portable reciprocating saws, pipe cutters, burning, and plasma torch. Specially designed containment enclosures will be used to prevent the spread of radioactive contamination while maintaining adequate ventilation.

15535 (CONF-860203—, pp 403-405) **Health physics or industrial hygiene.** Allen, J.K. (VIKEM Industries, Inc., Newburyport, MA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

With the continuing addition to the list of substances exhibiting carcinogenicity, the working health physics individual is being increasingly faced with situations where knowledge of industrial hygiene practices is necessary to insure protection of workers under his control. The problems will continue to multiply as events such as decommissioning of entire facilities and the advent of new decontamination and radwaste processing methods introduces a variety of new substances to the inventory of hazardous materials present in the working environment. A variety of specific situations will be discussed illustrating scenarios where industrial hygiene protocols must be implemented to insure complete safety for workers.

15536 (CONF-860203—, pp 407-416) **Training requirements for health physicists in the decontamination/decommissioning field.** Copenhaver, E.D.; Parzyck, D.C. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

While a significant decrease in the number of new facilities requiring health physics surveillance has occurred in the past decade, there has been a tremendous increase in the need for health physicists to fill regulatory requirements at existing facilities and the Decontamination and Decommissioning requirements of older facilities nearing the end of their operational lifetime. There is a continuing long-term need to provide trained health physicists with the special skills to meet these requirements. Decontamination and decommissioning programs require both basic and specialized health physics activities to be performed (1) to evaluate the radiation environment of the facility under consideration, (2) to establish the standards to which cleanup activities must be pursued, and (3) to adequately protect the personnel involved in the cleanup. Performance-based training, based on job task analysis, is an appropriate way to define the different types of health physics expertise required for D & D programs. Materials have been developed to describe potential job requirements in the radiation protection field, and the appropriate training goals to meet these requirements.

15537 (CONF-860203—, pp 417-422) **Site clean-up requirements: where does one dispose of dirt?.** Feldman, J. (Environmental Protection Agency, New York, NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Under its Superfund program the US Environmental Protection Agency (EPA) has committed itself to remediate certain residential and commercial properties impacted by an accumulation of indoor radon or thoron resulting from deposition of contaminated dirt. A case in point: The State of New Jersey now has a number of sites contaminated with the residues of radium or thorium extraction operations. The residues (dirt) were removed from the original operations areas and used as landfill, often in locations which are now around houses or other buildings. EPA's soil contamination limits for radium or thorium dictate that remediation efforts consist of removal of that fill. This solution presents the problem of disposing of large volumes of marginally radioactive materials. Options which recognize the present lack of low-level radioactive waste disposal facilities are examined here.

15538 (CONF-860203—, pp 423-429) **Decontamination/decommissioning of mixed hazardous and radioactive waste disposal sites.** Ferguson, R.R.; Jacobs, D.G.; Kimbrough, C.W. (H & R Technical Associates, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The production and research facilities operated for the US Department of Energy have generated a variety of solid and liquid wastes that contain both chemically hazardous and radioactive materials. In the past, regulations and waste management practices for radioactive wastes were developed independently from those for chemically hazardous wastes. Before implementation of the Resource Conservation and Recovery Act, the emphasis placed on management of hazardous wastes at facilities that handled both types of wastes was significantly less than the emphasis placed on management of radioactive wastes. Thus, inactive disposal sites that may be releasing inconsequential amounts of radioactivity to the environment may be releasing potentially significant amounts of chemically toxic heavy metals and organic compounds. In many instances, past disposal practices may dictate that the wastes associated with these sites be removed from current locations, treated to reduce toxicity, and disposed of in a more stable environmental setting. This paper outlines and describes the regulatory framework for site remediation and emphasizes how the concerns for health physics and occupational safety and health influence implementation.

15539 (CONF-860203—, pp 431-436) **Laboratory protocol for co-contaminated waste.** Kharkar, D.P.; Rodgers, D.; Penfold, L.; Dunstan, G.; Leventhal, L. (EAL Corp., Richmond, CA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The decommissioning of the inactive disposal sites such as uranium mill tailings, fuel processing plants, waste storage areas and decontamination of structures, equipment, laboratories, etc., generate hazardous substances containing varying amounts of radioactivity. The enactment of environmental legislation and regulations requires that environmentally responsible actions be taken to identify and eliminate the potential hazards resulting from the waste materials. A special handling procedure has been developed for screening, preparing, analyzing and disposing of radioactive samples undergoing hazardous waste characterization, i.e., co-contaminated samples. This paper addresses three principal concerns - laboratory compliance with State and Federal laws affect handling and release of radioactivity to uncontrolled areas, health and safety of laboratory workers, and handling practices that insure the laboratory's continued ability to perform environmental level radioactive analyses.

The analytical procedures used for co-contaminated samples are also discussed.

15540 (CONF-860203—, pp 437-442) **Disposal of slightly contaminated radioactive wastes from nuclear power plants.** Branagan, E.F. Jr.; Congel, F.J. (Nuclear Regulatory Commission, Washington, DC). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Current NRC regulations, with one exception, do not provide minimum levels of radioactivity in solid wastes which may be disposed of in a manner other than as radioactive waste. The exception (Title 10 Code of Federal Regulations Part 20.306) allows licensees to dispose of specified concentrations of tritium and carbon-14 used in liquid scintillation counting and in animal tissue without regard to radioactivity. However, this exception is of minimal use to nuclear power plant licensees. Current NRC regulations require that licensees dispose of even very slightly radioactively contaminated solid materials, with little flexibility as to the small quantities involved, at licensed low-level waste disposal sites or on a case-by-case basis pursuant to 10 CFR 20.302. On February 24, 1983 the NRC staff published Office of Inspection and Enforcement Information Notice No. 83-05, Obtaining Approval for Disposing of Very-Low Level Radioactive Waste - 10 CFR Section 20.302. Since that time, the staff has reviewed and approved about 20 requests for disposal of slightly contaminated radioactive materials. This paper describes the characteristics of the disposed wastes, the review process and the staff's dose guidelines.

15541 (CONF-860203—, pp 443-457) **Feasibility of centralizing disposal and processing facilities for low-level biomedical waste.** Osborne, T.W.; Terpilak, M.S.; Tupin, E.A. (RSO, Inc., Laurel, MD). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Research efforts were designed to examine the feasibility of a centralized processing facility for low level radioactive waste materials. The scope of the proposed facility was to provide a regional commercial processing service to medicine and biomedical research institutions who are unable to perform waste processing or treatment for themselves. The results of a literature search has provided an extensive description of low level wastes on a national basis. Sufficient information is now available concerning waste types, physical and chemical forms, radionuclide types and quantities, and volumes on a regional basis to support the operation of a reprocessing facility. Specifically, the total low level biomedical waste volume generated in the US during 1980 was approximately 660,000 cu ft. Commercial reprocessing operations which could handle approximately 81% of this volume and achieve a gross effective volume reduction ratio of 4 to 1 (including materials totally disposed of by the reprocessor) would be supported by a 15 million dollar annual industry. New technologies exist which are not currently used in commercial operations. There is an excellent potential for their use to provide an increase in the volume reduction rates on a cost effective basis. Current volume reduction rates of 3-5:1 could be increased to 10:1.

15542 (CONF-860203—, pp 459) **Overview of the surplus facilities management program.** Miller, C.E. Jr.; Baumann, B.L. (Dept. of Energy, Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In 1978, the Department of Energy established the Surplus Facilities Management Program (SFMP) to provide for the safe maintenance and eventual disposal of nuclear facilities used in early defense and nuclear energy programs. SFMP's current inventory includes approximately 300 shutdown, radioactively contaminated facilities located throughout the US and Puerto Rico. SFMP's responsibilities include maintenance and surveillance of facilities awaiting decommissioning, planning, and decommissioning implementation. Some examples of major SFMP decommissioning projects underway include: the Shippingport Atomic Power Station in Shippingport, Pennsylvania; the eight plutonium production reactors on the Hanford Site near Richland, Washington; and the Weldon Spring Site located near St. Louis, Missouri. This paper presents an overview of the Surplus Facilities Management Program and highlights its major decommissioning projects.

15543 (CONF-860203—, pp 461-469) **Intact decommissioning option for nuclear power plants.** Ostrow, S.L.; Oztunali, O.I.; Grant, T.J. (Ebasco Services, Inc., New York, NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Intact decommissioning has been proposed as an alternative method for decommissioning nuclear power plants complying with NRC license termination requirements as set forth in 10 CFR 50 and Regulatory Guide 1.86. Under this method, after the fuel and radioactive liquid and wastes are removed, highly radioactive systems and components, such as the reactor vessel and internals and the primary coolant system, would be sealed inside a designated boundary (e.g., the containment building) and left indefinitely. Radioactive materials outside the intact decommissioning boundary would be removed. Minimization of preparatory work, no consolidation of radioactive components in a particular location, and no maintenance or surveillance of the decommissioned facility distinguish this from the entombment option. The associated occupational radiation exposure should be significantly lower, and the public exposure no greater - and quite likely less - than the currently favored decommissioning method, immediate dismantlement. This paper presents the results of a study, sponsored by the National Environmental Studies Project of the Atomic industrial Forum (AIF/NESP), examining the viability and radiological consequences of intact decommissioning.

15544 (CONF-860203—, pp 471-485) **Decontamination of the chemical crane room and decontamination and decommissioning of the extraction chemical room at the West Valley Demonstration Project.** Phillips, E.C.; Golden, M.P. (West Valley Nuclear Services Inc., NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

This paper describes the decontamination of the Chemical Crane Room (CCR) of the West Valley Plant and the Extraction Chemical Room (XCR) from radioactively contaminated conditions to essentially shirt sleeve environments. In both cases, subsequent use re-contaminated the rooms. Prior to decontamination, general exposure rates in the CCR were 50 to 100 mR/hr with hot spots as high as 2000 mR/hr. Smearable levels on the floor were in the range of 10^5 to 10^6 dpm per 100/cm^2. Respiratory protection was mandatory for entry. In the Extraction Chemical Room (XCR) prior to decontamination and decommissioning (D/D), radiological surveys indicated a maximum radiation field of 5 mR/hr, due to sources internal to the room, and 20,000 dpm beta/100 cm^2 surface contamination. A radiation source external to the XCR caused a hot spot with a 9 mR/hr exposure rate inside the XCR. The CCR, located at the north end of the Chemical Process Cell (CPC) is for the storage and servicing of two bridge cranes used in the CPC. Decontamination and exposure reduction in the CCR has been completed using vacuum cleaning, damp wipe down, and surface grinding followed by shielding and painting. The decontamination and decommissioning of the Extraction Chemical Room (XCR), located on the fifth floor elevation (160') of the reprocessing plant at the WVDP, has been completed. D/D operations included removal of piping, tanks, supports, and equipment to provide a clean work area of about 3000 square feet and 17 feet high.

15545 (CONF-860203—, pp 487-495) **Decontamination and decommissioning of contaminated surplus facilities in the 200 areas of the Hanford site.** Speer, D.R.; Heine, W.F. (Rockwell Hanford Operations, Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC06-77RL01030.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Surplus Facilities Management Program (SFMP) of Rockwell Hanford Operations (Rockwell) is currently engaged in decontamination and decommissioning (D & D) of contaminated surplus facilities in and around the 200 Areas of the Hanford Site. These contaminated surplus facilities range in size and complexity from small wood-frame buildings to an 83,000 ft^2 reprocessing facility with monolithic concrete shielding walls and extensive residual radioactive contamination. The current inventory of facilities includes 3 major processing facilities, 8 large support buildings, 14 small support buildings, and 30 tanks, vaults, basins, and stacks. Completed activities include the decontamination or dismantlement of 9 facilities. Part of this involved the intact transport of four 50,000-gal tanks from a facility to a burial ground with subsequent filling and burial of the tanks. Work underway includes the decontamination, dismantlement, and entombment of a fuel reprocessing pilot plant and the decontamination of a plutonium processing facility with a goal of returning the processing facility to beneficial use. Thus far, the decontamination efforts have resulted in a significant reduction in hazards associated with safe storage of the 9 completed facilities as well as cost avoidances associated with returning buildings and equipment to beneficial use.

15546 (CONF-860203—, pp 497-504) **Remedial action of radium contaminated residential properties.** White, D.; Eng, J. (New Jersey Dept. of Environmental Protection, Trenton). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Since November 1983, the New Jersey Department of Environmental Protection (NJDEP) and the US Environmental Protection Agency (USEPA) have been in the process of identifying prc_ ' es in Montclair, Glen Ridge and West Orange, New Jersey, which were built over radium contaminated soil landfilled areas. Elevated indoor radon concentrations prompted the Centers for Disease Control (CDC) to issue a health advisory which included permanent remediation of radon progeny levels in excess of 0.02 Working Levels within two years of discovery. In order to expedite remedial action, NJDEP undertook a ten million dollar cleanup program. Remedial Action at the 12 residential properties encountered some unanticipated problems despite the efforts of numerous government agencies and their contractors to characterize the contamination as much as possible prior to remediation. Some of the unanticipated issues include contamination from other radionuclides, underestimation of removal volumes, and controversy over the transportation and disposal of the radium contaminated soil at a commercial facility in Nevada. This paper will review the approach taken by NJDEP to the remedial action for radium contaminated soil, discuss some of the issues encountered during the remedial action, and provide post remedial action data.

15547 (CONF-860203—, pp 505-512) **Experience gained during remedial action at residential properties contaminated with Th-232 and Ra-226.** Beck, W.L.; Lynt, R.; Lazo, E.N.; McDougall, M.R. (Bechtel National, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Seventeen residential properties contaminated with Th-232 and Ra-226 were decontaminated and restored by Bechtel National, Inc., during 1984 as part of the US Department of Energy's Formerly Utilized Sites Remedial Action Program. The extent of contamination varied from only a few cubic yards of material in the edge of one lawn to extensive contamination around foundations and under basement floors. Three unusual case histories will be described in detail. In the first case, a few cubic yards of contamination were expected, but more than 100 cubic yards were found. In Case 2, contamination was found under the floor of an addition to a house. Case 3 involved a home built on a lot where contaminated soils had been used as fill material to depths of up to 10 feet. The remedial action included the removal of the basement, including the floor slab and foundation. This paper will provide details about several lessons learned during remedial action at residential properties: (a) radiological characterization surveys must be thorough; (b) interviews with owners can provide helpful information about unusual or unexpected contamination problems; (c) radiological monitoring during construction is necessary for efficient and thorough remedial action; and (d) good public relations are an important element of residential remedial action projects. While these lessons may seem to be common sense items, the circumstances that require their use are often very subtle. As the case histories show, successful remedial action requires constant vigilance and careful attention to details.

15548 (CONF-860203—, pp 513-522) **Decontamination and decommissioning of a luminous dial painting facility: radiological characterization, segregation and disposal of building materials.** Ed, D.; Chu, L.; Chepulis, P.; Hamel, M. (Illinois Dept. of Nuclear Safety, Springfield). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The State of Illinois, Department of Nuclear Safety, has decontaminated and decommissioned the defunct Luminous Processes, Inc. facility located in Ottawa, Illinois. The state's overall experience throughout the project is generally described, with particular emphasis given to the radiological characterization (Ra-226+progeny and H-3) and subsequent segregation and disposal of building materials as either radioactive or non-radioactive. Experiences involving direct application of health physics principles (criteria selection, sampling schemes, analytical techniques, data reduction, quality assurance) are discussed. Experiences involving other health physics regimens (personnel protection and dosimetry, environmental monitoring) as well as social sciences and economic considerations (public perception, media relations, political involvement, contractor interactions, fiscal management) are discussed only insofar as they affect the radiological characterization, segregation and disposal processes.

15549 (CONF-860203—, pp 523-531) **Correlation between gamma radiation levels and soil radium concentrations at the Edgemont uranium mill site.** Wallace, R.G.; Reed, R.P.; Polehn, J.L.; Wilson, G.T. (Tennessee Valley Authority, Muscle Shoals, AL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Tennessee Valley Authority's uranium mill in Edgemont, South Dakota is being decommissioned. Approximately 4 million tons of contaminated tailings, building equipment, and contaminated soil and debris on the mill site will be removed to the disposal site located approximately 3 kilometers to the southeast. To minimize recontamination of cleaned areas, tailings removal will progress from the northwest corner to the southeast corner of the mill site. As specific areas are cleaned, surveys will be conducted to determine if the concentrations of radium-226 in soil are within the limits outlined in 40 CFR, Part 192. Conformance with the criteria will be demonstrated by a gamma survey of the area employing the differential, or delta-measurement, technique. This technique involves fitting the detector with a base and a receptacle for a removable high-density filter. By making measurements with and without the filter in place, a gamma radiation level proportional to the radium-226 concentration in soil can be determined. This paper describes the results obtained in the development of the correlation between the gamma survey measurements and the soil radium concentrations.

15550 (CONF-860203—, pp 533) **Analysis of uranium and thorium contaminated soils during a cleanup and interment operation.** Cole, L.W.; Bollenbacher, M. (Aerojet Heavy Metals Co., Jonesborough, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

At the Aerojet Heavy Metals Company facility near Jonesborough, Tennessee, a remedial cleanup operation was completed

during September, 1985. This operation involved burying approximately 550,000 ft^3 of soil contaminated with uranium and thorium. Approximately 120,000 ft^2 of area was cleared of the contaminated soil. To maintain a reasonable construction pace, it was necessary to complete the analysis very rapidly. Only one gamma spectroscopy system was available to perform the analysis. This paper discussed the procedure followed during the remedial operation. Counting times were kept short by using the largest sample mass in the chosen sample container, having a relatively high efficiency detector, and standardizing on the low energy x-rays of Thorium-234 and Protactinium-234. Counting accuracy of 20% at the 95% confidence level was achieved in counting times of 500 to 1000 seconds for levels of 30 pCi/g of Uranium-238 and 5 pCi/g of Thorium-232. The analytical procedure was able to keep up with the construction effort.

15551 (CONF-860203—, pp 535) **Idaho National Engineering Laboratory release criteria for decontamination and decommissioning.** Dolenc, M.R.; Case, M.J. (EG & G Idaho, Inc., Idaho Falls). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Criteria have been developed for release of Idaho National Engineering Laboratory (INEL) facilities and land areas following decontamination and decommissioning (D & D). Decommissioning release criteria in the form of dose guidelines were proposed by the US Nuclear Regulatory Commission as early as 1980. These criteria were used on an interim basis for INEL D & D projects. However, dose guidelines alone do not adequately cover the criteria necessary to release sites for unrestricted use. In actual practice, other parameters such as pathways analyses, sampling and instrumentation techniques, and implementation procedures are required to develop the basis for unrestricted release of a site. Thus, a rigorous approach for evaluating these other parameters is needed to develop acceptable D & D release criteria. Because of the complex and sensitive nature of the dose and pathways analyses work, a thorough review by experts in those respective fields was desired. Input and support in preparing or reviewing each part of the criteria development task was solicited from several DOE field offices. Experts were identified and contracted to assist in preparing portions of the release criteria, or to serve on a peer-review committee. Thus, the entire release criteria development task was thoroughly reviewed by recognized experts from each DOE field office, to validate technical content of the INEL site-specific document.

15552 (CONF-860203—, pp 537) **Decontamination of an Americium-241 site.** Murphy, G.L.; Deming, E.J.; Caniano, R.J.; Emswiler, T.R.; Kirsch, G.E. (Oak Ridge Associated Universities, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

A rural residence was modified for operation as a hot lab with glove box capabilities designed to handle up to 25 Ci of Americium-241 in the powder oxide form. The facility operated under an NRC license for over ten years, when the license was amended for storage of contaminated materials only. A 1983 site survey conducted by Oak Ridge Associated Universities Radiological Site Assessment Program (ORAU/RSAP) indicated radioactive contamination present in the environment (soils and groundwater) and in unrestricted areas of the house and unattached garage. The site was declared an imminent hazard by US Nuclear Regulatory Commission (USNRC III), and the facility was closed pending decontamination under the Environmental Protection Agency (EPA) superfund. This paper will demonstrate that a cooperative effort between USNRC (III), EPA, Department of Energy (DOE), Battelle-Columbus Laboratory, and ORAU/RSAP resulted in an efficient and effective decontamination of the site. The co-operative effort enabled many problems to be overcome, and resulted in the clean-up completed under budget and on schedule.

15553 (CONF-860203—, pp 539-542) **Inventory of sites used to develop residual radioactivity criteria.** Ronca-Battista, M.; Hardeman, J.C. Jr. (Environmental Protection Agency, Washington, DC). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The US Environmental Protection Agency (EPA), in conjunction with the National Conference of Radiation Control Program Directors (CRCPD), has compiled an inventory of never licensed or otherwise poorly documented sites that may be contaminated with radioactive materials. This effort is in support of the EPA's development of radiation protection criteria for residual radioactivity at decommissioned sites. The inventory will help to establish the range of circumstances for which criteria are needed, as well as the suitability of candidate criteria for actual situations. The information will also be used to develop model sites and facilities for analyzing technical and economic feasibility of residual radioactivity criteria and to assess costs and benefits of alternate criteria. Relevant information about each site, such as radionuclides, waste forms, and quantities present will be included in the inventory when such information is available. The CRCPD has requested that each State radiation control agency furnish the information for the inventory. The inventory supplements the relatively extensive documentation of sites regulated by Federal or State agencies with information on old or unlicensed sites, such as old waste storage sites or radium ore processing facilities.

15554 (CONF-860203—, pp 543-551) **Database construction for assessment of chronic radionuclide releases.** Hively, L.M.; Sjoreen, A.L.; Bledsoe, J.L. (Oak Ridge National Lab., TN). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC05-84OR21400.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Oak Ridge National Laboratory (ORNL) has developed a comprehensive dose/risk assessment methodology, CRRIS (Computerized Radiological Risk Investigation System), for assessment of atmospheric radionuclide releases (e.g., during decontamination and decommissioning). Radiological effects are calculated for direct atmospheric and ground exposure and for consumption of contaminated agricultural products. Previously, population and agricultural data for CRRIS were tabulated on 1/2-degree square grid cells. This coarse resolution resulted in anomalies such as population in water bodies, agricultural production in city centers, and nonconservation of population over the assessment grid. An even finer mesh (2-minute square grid) is inadequate in densely populated cities where 20,000 or more people live in a square block. These difficulties are overcome by a higher resolution technique using US Census Bureau population data at the most detailed [enumeration district (ED)] level available and by excluding population from unpopulated areas (e.g., water bodies). Agricultural data are available at only the county level and are apportioned to the ED grid according to farm population, conserving the original data. This paper discusses the database construction using Tennessee as an illustration.

15555 (CONF-860203—, pp 553-561) **Use of computerized, 3-dimensional solids modeling and data base management to support radiation mapping and ALARA planning.** Schauss, R.D.; Slobodien, M.S. (Nuclear Information Sciences Co., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The RADiation Mapping and ALARA Planning System (RADMAPS) under development by GPU Nuclear Corporation in conjunction with Construction Systems Associates, Inc., integrates computerized solids modeling and data base management to provide an automated, integrated systems solution to the problems associated with acquiring, managing, and communicating plant radiological data at nuclear facilities. This presentation describes the

status of the RADMAPS development and outlines plans for future expansion.

15556 (CONF-860203—, pp 563) **Health physics and operational experience gained from slurry transfer of wastes containing 780 curies of radium-226.** Borden, W.C.; Land, R.R. (Bechtel National, Inc., Oak Ridge, TN). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

During remedial action at the DOE Niagara Falls Storage Site 3.5 million kilogram (3891 ton) of uranium ore residues (code named K-65 during the Manhattan Project) were slurry transferred about one mile from a concrete water tower to an engineered waste containment facility. This operation presented a number of unusual health physics problems, mandating special handling, measurement, and exposure control methodologies. Principles among these were: (1) a specific activity of 220,000 pCi/gm; (2) open air concentrations of radon-222 of up to 60,000 pCi/l; (3) radon concentrations inside the tower of 1,700,000 pCi/l; (4) exposure rates of up to 350 mR/hr; (5) widely varying climatic conditions; and (6) working atop a 165 foot tall, 40 foot diameter, structure in these conditions. This paper will describe the transfer operation, its problems, problem solutions, and successes. Detailed attention is given to personnel and environmental monitoring, as well as contamination and exposure control methodologies. Operations concluded with the K-65 residues stored in an environmentally stable condition, less than 10 man-rem of worker exposure, and average off-site radon-222 concentrations of less than 0.3 pCi/l above background.

15557 (CONF-860203—, pp 565-573) **Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system.** Stenner, R.D.; Washburn, D.K.; Denham, D.H. (Pacific Northwest Lab., Richland, WA). Dec 1986. NTIS $23.00. File Number DE86900357. Contract AC06-76RL01830.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Pacific Northwest Laboratory (PNL) provided technical assistance to the Office of Operational Safety (OOS) in developing their Assurance Program for Remedial Action (APRA). The APRA Bibliography Management System (BMS), a microcomputer-operated system designed to file, locate and retrieve project-specific bibliographic data, was developed to manage the documentation associated with APRA. The BMS uses APRABASE, a PNL-developed computer program written in dBASE II/sup (b)/ language, which is designed to operate using the commercially available dBASE II database software. This paper describes the APRABASE computer program, its associated subprograms, and the dBASE II APRA file. Although the BMS was designed to manage APRA-associated documents, it could be easily adapted for use in handling bibliographic data associated with any project.

15558 (CONF-860203—, pp 575-578) **Decommissioning the world's first commercial nuclear fuel reprocessing facility.** Marchetti, S.; Hoffman, D. (West Valley Nuclear Services Co., Inc., NY). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

An overview of the West Valley Demonstration Project is presented. Nuclear waste forms managed at the project premises include high level liquid and solid waste, spent fuel, transuranic and low level wastes. The key purpose of this paper is to outline the decontamination and decommissioning program and to provide a pictorial description of associated techniques developed here. The principal goal of the Project is to vitrify more than 2 million liters of liquid high level waste. This is addressed and a pictorial presentation of vitrification equipment is included.

15559 (CONF-860203—, pp 579) **Final resting place of a cesium 137 gauge.** McNees, J.L.; Whatley, K.E.; Maryland, C. (Bureau of Radiological Health, Montgomery, AL). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

In April of 1985 an industry reported the loss of four industrial gauges that contained cesium 137. The State of Alabama surveyed eight scrap iron yards where the devices were believed to have been taken and found one of the four. The State then requested aerial monitoring assistance from the US Department of Energy. In July 1985 the DOE helicopter located an area of cesium 137 contamination in a waste slag dump yard. Examination of the waste slag dump showed maximum exposure levels of approximately 100 microR per hour and maximum soil contamination of 4.9×10^{-4} microcuries per gram. The area of contamination extended over 13,000 square feet. Erosion of cesium-containing waste slag was identified as the greatest potential health hazard associated with the contamination. The cost-benefit of spending $500,000+ to remove the material to a commercial burial site is at least questionable. Consideration is being given to a request by the owners of the property for burial on site.

15560 **(DOE/DP/93032—T1) Scientific basis for risk assessment and management of uranium mill tailings.** (National Research Council, Washington, DC (USA). Uranium Mill Tailings Study Panel). 1986. Contract AC01-84DP93032. 260p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE87003893.

Uranium mill tailings are the finely ground sand-like material that is left after uranium is extracted from ore. As of early 1983, approximately 200 million metric tons of uranium mill tailings covering 1300 ha at 51 sites had accumulated in the United States. Most of these sites are in the arid Southwest. Uranium mill tailings present health and environmental concerns because of the residual radioactivity that they contain and because of a variety of other potential pollutants, such as chlorides, sulfates, and heavy metals. The milling process makes the radioactive and nonradioactive materials contained in the ore when it was mined much more mobile and also adds several potential contaminants to the tailings material during the milling process. Exposure routes of concern are release of the gas ^{222}Rn, airborne dust, and surface and groundwater contamination. In addition, the use of tailings as construction material or fill can lead to dangerously high levels of radon in associated buildings. At the request of the Department of Energy, a National Research Council study panel, convened by the Board on Radioactive Waste Management, has examined the scientific basis for risk assessment and management of uranium mill tailings and issued this final report containing a number of recommendations. Chapter 1 provides a brief introduction to the problem. Chapter 2 examines the processes of uranium extraction and the mechanisms by which radionuclides and toxic chemicals contained in the ore can enter the environment. Chapter 3 is largely devoted to a review of the evidence on health risks associated with radon and its decay products. Chapter 4 provides a consideration of conventional and possible new technical alternatives for tailings management. Chapter 5 explores a number of issues of comparative risk, provides a brief history of uranium mill tailings regulation, and concludes with a discussion of choices that must be made in mill tailing risk management.

15561 **(DOE/EIS—126-F-Vol.1) Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 1, Text.** (USDOE Albuquerque Operations Office, NM. Uranium Mill Tailings Remedial Action Project Office). Dec 1986. 454p. NTIS, PC A20/MF A01. File Number DE87005502.

This statement evaluates and compares the environmental impacts associated with the remedial actions of the residual radioactive materials remaining at the inactive uranium processing site and associated vicinity properties at Grand Junction, Mesa County, Colorado. This statement is also intended to aid the BLM in amending their management framework plans and final resource management plan, as well as assisting in compliance with the withdrawal application as appropriate. The site is a 114-acre tract of private and state owned land which contains approximately 3.1 million cubic yards of tailings and associated contaminated soils. The vicinity properties are homes, businesses, public buildings, and vacant lots which may have been contaminated during construction by the use

of tailings as building material. An estimated 3465 vicinity properties would be cleaned up during remedial action of the tailings pile. The tailings were produced by the former Climax Uranium Company which processed uranium ore, which it sold to the US Atomic Energy Commission from 1951 to 1966 and to private sources from 1966 to 1970. This statement evaluates six alternatives for stabilization and disposal of the tailings and other contaminated materials: no action; stabilization at the Grand Junction site; disposal at the Cheney Reservoir site with truck transport; disposal at the Cheney Reservoir site with train and truck transport; disposal at the Two Road site with truck transport; and disposal at the Two Road site with train and truck transport. All of the alternatives except no action include remedial action at an estimated 3465 vicinity properties. Alternative 3 is DOE's preferred alternative.

15562 **(DOE/EIS—126-F-Vol.2) Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 2, Appendices.** (USDOE Albuquerque Operations Office, NM. Uranium Mill Tailings Remedial Action Project Office). Dec 1986. 341p. NTIS, PC A15. File Number DE87005555.

Volume II contains Appendix F - Hydrology Report and Appendix G - Floodplain and Wetlands Assessment.

0550 Safeguards, Inspection, And Accountability

REFER ALSO TO CITATION(S) 15388, 15778, 16385, 16389, 16647

15563 **(DOE/DP/48013—T1) Fundamental research of decision support systems: Final report.** Kurstedt, H.A. Jr. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Management Systems Labs.). 1986. Contract AS05-83DP48013. 239p. NTIS, PC A11. File Number DE87004644.

Through an iterative application of Decision Support Systems (DSS) apparatus and evolution of DSS concepts, we redefined DSS from a systems perspective. By focusing on successful DSS and the definition of success for the newly-defined DSS, we generated a paradigm for understanding, applying, and improving DSS. The significance of the research is that we now: (1) understand the various roles management tools play within the new DSS concept; (2) recognize the need for characterizing the domain of responsibility of a manager to obtain a successful DSS; and (3) have learned special characteristics of government agencies like Nuclear Materials (NM) to identify what features of the new DSS concept can be expected to improve performance.

15564 **(LA—10811-MS) Fundamental data analyses for measurement control.** Campbell, K.; Barlich, G.L.; Fazal, B.; Strittmatter, R.B. (Los Alamos National Lab., NM (USA)). Feb 1987. Contract W-7405-ENG-36. 24p. NTIS, PC A02/MF A01. File Number DE87004767.

A set of measurment control data analyses was selected for use by analysts responsible for maintaining measurement quality of nuclear materials accounting instrumentation. The analyses consist of control charts for bias and precision and statistical tests used as analytic supplements to the control charts. They provide the desired detection sensitivity and yet can be interpreted locally, quickly, and easily. The control charts provide for visual inspection of data and enable an alert reviewer to spot problems possibly before statistical tests detect them. The statistical tests are useful for automating the detection of departures from the controlled state or from the underlying assumptions (such as normality). 8 refs., 3 figs., 5 tabs.

15565 **(LA-UR—86-4113) LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis.** Smith, S.T.; Lim, J.J.; Phillips, J.R.; Tisinger, R.M.; Brown, D.C.; FitzGerald, P.D. (Los Alamos National Lab., NM (USA); Lim and Orzechowski Associates (USA); USDOE, Washington, DC). 1986. Contract W-7405-ENG-36. 21p. (CONF-8611117—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003720.

From Annual meeting of the Society for Risk Analysis; Boston, MA, USA (9 Nov 1986).

At Los Alamos National Laboratory, we have developed an original methodology for performing risk analyses on subject systems characterized by a general set of asset categories, a general spectrum of threats, a definable system-specific set of safeguards protecting the assets from the threats, and a general set of outcomes resulting from threats exploiting weaknesses in the safeguards system. The Los Alamos Vulnerability and Risk Assessment Methodology (LAVA) models complex systems having large amounts of "soft" information about both the system itself and occurrences related to the system. Its structure lends itself well to automation on a portable computer, making it possible to analyze numerous similar but geographically separated installations consistently and in as much depth as the subject system warrants. LAVA is based on hierarchical systems theory, event trees, fuzzy sets, natural-language processing, decision theory, and utility theory. LAVA's framework is a hierarchical set of fuzzy event trees that relate the results of several embedded (or sub-) analyses: a vulnerability assessment providing information about the presence and efficacy of system safeguards, a threat analysis providing information about static (background) and dynamic (changing) threat components coupled with an analysis of asset "attractiveness" to the dynamic threat, and a consequence analysis providing information about the outcome spectrum's severity measures and impact values. By using LAVA, we have modeled our widely used computer security application as well as LAVA/CS systems for physical protection, transborder data flow, contract awards, and property management. It is presently being applied for modeling risk management in embedded systems, survivability systems, and weapons systems security. LAVA is especially effective in modeling subject systems that include a large human component.

15566 **FERC perspectives on nuclear fuel accounting issues.** McDanal, M.W. (Federal Energy Regulatory Commission). *Transactions of the American Nuclear Society;* **53**: 74-76(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of the presentation is to discuss the treatment of nuclear fuel and problems that have evolved in industry practices in accounting for fuel. For some time, revisions to the Uniform System of Accounts have been considered with regard to the nuclear fuel accounts. A number of controversial issues have been encountered on audits, including treatment of nuclear fuel enrichment charges, costs associated with delays in enrichment services, the treatment and recognition of fuel inventories in excess of current or projected needs, and investments in and advances to mining and milling companies for future deliveries of nuclear fuel materials. In an effort to remedy the problems and to adapt the Federal Energy Regulatory Commission's accounting to more easily provide for or point out classifications for each problem area, staff is reevaluating the need for contemplated amendments to the Uniform System of Accounts.

15567 **Nuclear fuel lease accounting.** Danielson, A.H. *Transactions of the American Nuclear Society;* **53**: 76-80(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The subject of nuclear fuel lease accounting is a controversial one that has received much attention over the years. This has occurred during a period when increasing numbers of utilities, seeking alternatives to traditional financing methods, have turned to leasing their nuclear fuel inventories. The purpose of this paper is to examine the current accounting treatment of nuclear fuel leases as prescribed by the Financial Accounting Standards Board (FASB) and the Federal Energy Regulatory Commission's (FERC's) Uniform System of Accounts. Cost accounting for leased nuclear fuel during the fuel cycle is also discussed.

15568 **Logbooks: A key to test/experiment data integrity.** Henderson, J.T. (Sandia National Labs., Albuquerque, NM 87185). pp 219-221 of Proceedings of the 38th annual quality congress. Milwaukee, WI; American Society for Quality Control (1984). (CONF-840569—).

From 38. ASQC annual quality congress; Chicago, IL, USA (14 May 1984).

The Waste Management and Transportation Directorate of Sandia National Laboratories (SNL) is applying a QA Program in accordance with DOE/AL Order 5700.6A to the acquisition of research and technology (R&T) data. This QA Program has recently placed emphasis on the importance of test/experiment logbooks to data integrity. This paper addresses the rationale as well as the entries (and supporting data) necessary for generating a complete and defensible logbook. Since such entries may be either of a one-time or repetitive nature, further distinctions and guidance are offered. This paper also addresses logbook maintenance and control. The time spent in documenting performance history may be wasted or rendered ineffectual if logbooks are not subject to routine maintenance and proper controls. Also, the human engineering of logbook generation is considered so that a structured format can be followed.

0560 Legislation And Regulations

REFER ALSO TO CITATION(S) 15399, 15435, 17684

15569 **(INIS-XN—37) Radiation Protection Act 26.4.1957/174.** (International Atomic Energy Agency, Vienna (Austria)). 26 Apr 1957. 3p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701299.

This Act as amended sets the radiation protection principles applicable to nuclear activities in Finland. These include nuclear installations, nuclear materials, radioactive materials and equipment producing radiation. It provides for a licensing procedure for the possession, use and trade in radioactive materials and equipment producing radiation. (NEA).

15570 **(INIS-XN—38) Radiation Protection Decree 27.9.1957/328.** (International Atomic Energy Agency, Vienna (Austria)). 27 Sep 1957. 5p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701300.

This Decree as amended was made under the Radiation Protection Act 1957 and deals with the protection of workers against ionizing radiation. It specifies the licensing procedure required for possession, use, trade in, export and import of radioactive materials and equipment. (NEA).

15571 **(INIS-XN—39) Decision on radiation protection of 5.11.1968/594.** (International Atomic Energy Agency, Vienna (Austria)). 5 Nov 1968. 30p. (In Finnish). NTIS (US Sales Only), PC A03/MF A01. File Number DE87701301.

This decision on radiation protection was issued by the Finnish Ministry of Social Affairs and Health. It contains tables of radioisotopes and specifies radiation limits. (NEA).

15572 **(INIS-XN—41) Decree relating to the annual leave of persons working under harmful radiation conditions (No. 175/67).** (International Atomic Energy Agency, Vienna (Austria)). 14 Apr 1967. 1p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701303.

This Decree as amended concerns radiation workers. It deals with the annual leave of persons occupationally exposed to radiation. (NEA).

15573 **(INIS-XN—42) Council of State decision relating to examinations under Section 5 of the Radiation Protection Act (No. 243/58).** (International Atomic Energy Agency, Vienna (Austria)). 5 Jun 1958. 1p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701304.

This decision issued by the Finnish Council of State was issued under Section 5 of the Radiation Protection Act 1957 according to which owners or holders of radioactive waste materials are under obligation to render them harmless and at their expense. (NEA).

15574 **(INIS-XN—46) Ministerial Decision No. 116 on the export of some materials, equipment and devices in the field of Atomic Energy.** (International Atomic Energy Agency, Vienna (Austria)). 18 Jan 1977. 2p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701308.

Published in Finnish Official Gazette No. 116.

This decision of the Ministry of Trade and Industry contains a list of equipment, facilities and materials other than nuclear materials the export of which requires a special permit in accordance with the Atomic Energy Act. The content of the list follows closely the trigger list defined by Memorandum B in the Appendix to IAEA document INFCIRC/209. (NEA).

15575 **(INIS-XN—48) Decision of the National Board of Navigation on the Carriage of Dangerous Goods in Ships.** (International Atomic Energy Agency, Vienna (Austria)). 1984. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701310.

This is an unofficial English translation of a decision, which was made in accordance with Section 12 of Decree No. 357 of 16th May 1980 on the Carriage of Dangerous Goods in Ships. It adopts by reference the IMO/IMDG Code with the packaging Annex and Amendments 1 - 21. Where the National Board of Navigation has not provided otherwise, the Code shall be applied to vessels carrying dangerous goods, to the classification, packing, marketing and handling of dangerous goods and the stowage of such goods on board, and to documents related to carriage of dangerous goods. The decision applies to vessels engaged in traffic in Finnish territorial waters and to all Finnish vessels, even when operating outside Finnish territorial waters. The decision designates the Finnish Centre for Radiation and Nuclear Safety as the competent authority where approval certificates for transport, packages or containers of radioactive materials are required. (NEA).

15576 **(INIS-XN—49) Aviation Regulation OPS M1-18 on the Transport of Dangerous Goods by Air.** (International Atomic Energy Agency, Vienna (Austria)). 10 Jan 1984. 17p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701311.

This regulation, issued by the National Board of Aviation in accordance with Section 49 of the Aviation Act (595/64) and Section 108 of the Aviation Decree (525/68), adopts by reference the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air. The content of the regulation follows closely Annex 18 to the Chicago Convention on International Civil Aviation. The regulation specifically provides that in packaging of radioactive materials the requirements of ICAO-TI are to be followed and designates the Finnish Centre for Radiation and Nuclear Safety as the competent authority in Finland to test and certify packaging. (NEA).

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

REFER ALSO TO CITATION(S) 16408

15577 **TURF Californium facility at Oak Ridge National Laboratory.** King, L.J. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* **53**: 158-159(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The TURF Californium Facility at the Oak Ridge National Laboratory (ORNL) has been expanded and modified, and the Californium Industrial Sales/Loan Program has been transferred to ORNL from the Savannah River Plant. The TURF Californium Facility has been operated since 1970 by the staff of the ORNL Transuranium Processing Plant (TPP) as part of the Heavy-Element Research Program of the US Department of Energy (DOE) Office of Basic Energy Sciences (BES). The facility was built to provide hot-cell space that is free of ^{244}Cm contamination in which

to recover high-isotopic-purity ^{248}Cm, the alpha decay daughter of ^{252}Cf, for use in research. All ^{252}Cf handling operations for the BES program, including purification, packaging, and neutron source fabrication, are done in the TURF Californium Facility.

15578 **Nuclear data for gadolinium production.** Holden, N.E. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 163-164(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

There has been a marked increase in requests for neutron cross-section data of the rare-earth isotopes, ^{152}Gd, ^{153}Gd, ^{151}Eu, ^{152}Eu, ^{153}Eu, ^{154}Eu, and ^{155}Eu because of the use of natural europium-oxide in reactor production of ^{153}Gd. This gadolinium isotope is needed because of its use as the working ingredient in an advanced medical scanning machine that can detect loss of bone minerals such as calcium, a possible cause of the disease osteoporosis. Hanford's Fast Flux Test Facility plans to begin production of several ^{153}Gd specimens during this autumn's operating cycle. An analysis of various experiments led to recommended values for the cross sections and resonance integrals, which are displayed and compared with the ENDF/B-V values. The detailed data underlying these recommendations are presented.

15579 **Californium-252 neutron calibration flux distribution by Monte Carlo simulation.** West, L.; Stingley, R.M. (Univ. of Arkansas, Fayetteville). *Transactions of the American Nuclear Society;* **53**: 164-165(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the past few years, ^{252}Cf neutron sources have become the primary means of defining a benchmark neutron field. It is the only nuclide with sufficient spontaneous fission neutrons to achieve a useful neutron flux level; and the ^{252}Cf fission spectrum is much better known than any other benchmark employed for reactor dosimetry calibration. Total neutron emission for small sources can be determined by the National Bureau of Standards (NBS) using a 4π manganese sulfate bath. However, dosimetry irradiations are typically performed in a plane perpendicular to the cylindrical axis of the source, not in 4π geometry. Cylindrical encapsulation will certainly introduce some anisotropy; i.e., angular dependence in the total flux and in the flux per unit energy. Any anisotropy of the flux will systematically bias an irradiation result since an isotropic flux distribution is usually assumed if no anisotropy information is available. An anisotropy factor in the flux of ~1.01 can be considered to be a small bias, even if the irradiation result is accurate to 2% or less. The flux anisotropy factor indicated by this work is closer to 1.05 for certain sources, a significant factor.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 15577, 15843

15580 **(OEFZS—4376) Non-contacting thickness-gauging of fine steel plates.** Frevert, E. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Oct 1986. 36p. (In German). (IA—151/86). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700848.

With plates of 15 different alloys of fine steel the absorption of the gamma rays of /sup 137/Cs was measured as a function of the thickness. In 5 series of measurements the distances source - detector and source - probe were changed. The analysis of the records obtained showed that with a constant distance source - detector of about 250 mm a change of the position of the probe of more than +-20 mm has no influence to the measuring values. A distribution of the probes in 4 groups with average values of the absorption coefficients leads to deviations of the calculated values to the nominal thickness values between +0.18 mm and -0.16 mm, whereat by this distribution systematic errors occure. For exact measurements therefore the alloy specific absorption coefficients must be taken. An accuracy of better than +-0.1 mm must be obtainable.

15581 **Multipurpose prompt gamma facility.** Miller, G.D.; Wehring, B.W. (North Carolina State Univ., Raleigh). *Transactions of the American Nuclear Society;* **53**: 161-162(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper deals with the design, construction, and utilization of a multipurpose Prompt Gamma Facility at the North Carolina State University (NCSU) PULSTAR Nuclear Reactor. Specifically, features of the design that promote multi-use, and test results for various applications are presented.

0703 Isotopic Power Supplies

15582 **(LA—10742-MS) General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series.** Cull, T.A.; Pavone, D. (Los Alamos National Lab., NM (USA)). Sep 1986. Contract W-7405-ENG-36. 36p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87002234.

The General-Purpose Heat Source (GPHS) is a modular component of a radioisotope thermoelectric generator (RTG) that will provide electric power for space missions. The initial RTG applications will be for the NASA Galileo and the ESA Ulysses missions. Each of the 18 GPHS modules in an RTG contains four $^{238}PuO_2$-fueled clads and generates 250 W/sub (t)/. A series of Safety Verification Tests (SVTs) has been conducted to assess the ability of the GPHS fueled clads to contain the plutonia in accident environments. Because a launch pad or postlaunch explosion of the Space Transportation System Vehicle (space shuttle) is one conceivable accident, the SVT plan included a series of tests to simulate the fragment environment that the RTG and GPHS modules would experience in such an event. These tests deal specifically with the flat-on collision of flyer-plate-type fragments with bare, simulant-fueled (depleted UO_2) clads. Results of these tests suggest that the fueled clad is only minimally breached by collision with 3.53-mm-thick flyer-plate-type fragments of space shuttle alloy at velocities up to 1170 m/s. However, collision of a 38.1-mm-thick plate with a bare GPHS clad, at a velocity of 270 m/s, results in a total release of fuel.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 15602

15583 **Catalyzed steam gasification of low-rank coals to produce hydrogen.** Sears, R.E.; Timpe, R.C.; Galegher, S.J.; Willson, W.G. (Univ. of North Dakota, Energy Research Center, Box 8213, University Station, Grand Forks, ND 58202). *Preprints of Papers, American Chemical Society, Division of Fuel Chemistry;* **31**: No. 3, 166-175(1986). (CONF-8609181—).

From ACS symposium on syngas conversion catalysis advances in gasification; Santa Clara, CA, USA (7 Sep 1986).

Advance coal gasification technologies using low-rank coal is a promising alternative for meeting future demand for hydrogen. Steam gasification tests conducted at temperatures between 700° and 800°C and atmospheric pressure resulted in product gas compositions matching those predicted by thermodynamic equilibrium calculations, 63-65 mol% hydrogen and less then 1 mol% methane. Steam gasification tests with four low-rank coals and a single bituminous coal were performed in a laboratory-scale thermogravimetric analyzer (TGA) at temperatures of 700°, 750°, and 800°C to evaluate process kinetics with and without catalyst addition. Catalysts screened included K/sub 2/CO/sub 3/, Na/sub 2/CO/sub 3/, trona, nahcolite, sunflower hull ash, and recycled lignite ash. North Dakota and Texas lignite chars were slightly more reactive than a Wyoming subbituminous coal char and eight to ten times more reactive than an Illinois bituminous coal char. Pure and mineral (trona nd nahcolite) alkali carbonates and recycled ash from K/sub 2/CO/sub 3/-catalyzed steam gasification tests substantially im-

proved low-rank coal steam gasification rates. The reactivities obtained using trona and nahcolite to catalyze the steam gasification were the highest, at nearly 3.5 times those without catalysts.

0803 Transport

REFER ALSO TO CITATION(S) 16242

0808 Properties

REFER ALSO TO CITATION(S) 16144

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 15284, 15599, 16403, 16405

15584 **(BMFT-FB-T—86-083) Biomass partial gasification. Final report.** Meyer, H. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.); Werner (F.) Industrie-Ausruestungen G.m.b.H., Geisenheim (Germany, F.R.). Abt. Neue Technologie - Energie). Dec 1986. 33p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE87751298.

The exploitation of tree bark for energy purposes was investigated in the research project with the goal of producing high-grade charcoal and poor gas suitable for engines. The drying of tree bark with an initial humidity of over 200% abs. dry to the humidity of max. 20% required for the gasification process proved to be very expensive when using mechanical as well as thermal techniques. Besides this, the theoretical and practical investigations showed that the gas quality was unsatisfactory for use in engines despite high preheating of the air, and that charcoal can only be produced in small amount. The attainable charcoal quality hardly promises an economically interesting field of application. With 10 tabs., 2 figs.

15585 **(CONF-860709—3) Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends.** Srivastava, V.; Fannin, K.F.; Biljetina, R.; Chynoweth, D.P.; Hayes, T.D. (Institute of Gas Technology, Chicago, IL (USA); Florida Univ., Gainesville (USA); Gas Research Inst., Chicago, IL (USA)). Jul 1986. 25p. Institute of Gas Technology, 3424 South State Street, Chicago, IL 60616. File Number TI87900436.

From Conference on research and applications of aquatic plants for water treatment and resource recovery; Orlando, FL, USA (20 Jul 1986).

The Institute of Gas Technology (IGT) conducted a comprehensive laboratory-scale research program to develop and optimize the anaerobic digestion process for producing methane from water hyacinth and sludge blends. This study focused on digester design and operating techniques, which gave improved methane yields and production rates over those observed using conventional digesters. The final digester concept and the operating experience was utilized to design and operate a large-scale experimentla test unit (ETU) at Walt Disney World, Florida. This paper describes the novel digester design, operating techniques, and the results obtained in the laboratory. The paper also discusses a kinetic model which predicts methane yield, methane production rate, and digester effluent solids as a function of retention time. This model was successfully utilized to predict the performance of the ETU. 15 refs., 6 figs., 6 tabs.

15586 **(CONF-870253—1) Recovery of methane from combined industrial and municipal wastewater by anaerobic treatment.** Donaldson, T.L. (Oak Ridge National Lab., TN (USA)). Feb 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005686.

From Industrial environmental management conference; Hilton Head, SC, USA (25 Feb 1987).

A brief description of selected programs to recover methane from waste waters is provided. Projects described include Lubbock Feedlot at Lubbock, Texas, ANFLOW Plant at Knoxville, Tennessee, RefCoM Plant at Pompano Beach, Florida, and Bacardi Corp. Anaerobic Treatment Plant at San Juan, Puerto Rico. 8 refs.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 15599

15587 **(BNL—39087) Methanol for transportation of natural gas values.** O'Hare, T.E.; Sapienza, R.S.; Mahajan, D.; Skaperdas, G.T. (Brookhaven National Lab., Upton, NY (USA)). Jun 1986. Contract AC02-76CH00016. 11p. (CONF-8606197—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005391.

From Joint conference on the introduction and development of methanol as an alternative fuel; Columbus, OH, USA (26 Jun 1986).

A new process under development at the Brookhaven National Laboratory departs significantly from current commercial practice for synthesizing methanol from natural gas. The significant innovations in this process are described and the consequences of the changes are outlined. A process flow sheet for the new synthesis is described and a cost estimate, based on the equipment and flow sheet, is presented and compared with cost estimates for conventional, low pressure methanol synthesis. In addition, cost estimates for shipping natural gas values to distant markets as synthesized methanol, or as liquefied natural gas, are compared. The economic advantages of the Brookhaven methanol process indicate that methanol shipping can deliver natural gas values at lower cost than can LNG for the same energy delivery, while decreasing capital investment requirements significantly. 1 fig., 3 tabs.

15588 **(BNL—39088) Low temperature methanol process: The next step.** O'Hare, T.E.; Sapienza, R.S.; Mahajan, D.; Skaperdas, G.T. (Brookhaven National Lab., Upton, NY (USA)). May 1986. Contract AC02-76CH00016. 11p. (CONF-8605223—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005390.

From 11. annual conference on clean liquid and solid fuels; Palo Alto, CA, USA (7 May 1986).

Gas production is on the increase and international trade even more so, with LNG making most progress. It has been projected that by the year 2000, approximately 190 million metric tons per year of LNG could be moving in worldwide trade. The further penetration of natural gas into distant markets can be substantially increased by a new methanol synthesis process under development at the Brookhaven National Laboratory. The new methanol process is made possible by the discovery of a catalyst that drops synthesis temperatures from about 275°C to about 100°C. The new low temperature liquid catalyst can convert synthesis gas completely to methanol in a single pass through the methanol synthesis reactor. This characteristic leads to a further major improvement in the methanol plant. Atmospheric nitrogen can be tolerated in the synthesis gas, and still the volume of gas fed to the reactor can be smaller than the volume of gas that must be fed to the reactor when accommodating the very low conversions furnished by the best of currently available catalysts. The energy disadvantage of the methanol option must be balanced against the advantage of a much lower capital investment requirement made possible by the new BNL synthesis. Preliminary estimates show that methanol conversion and shipping require an investment for liquefaction to methanol, and shipping liquefied methanol that can range from 35 to 50% of that needed for the LNG plant and LNG shipping fleet. This large reduction in capital requirements is expected to make liquefaction to methanol attractive in many cases where the LNG capital needs are prohibitive. Alternately, the economically viable minimum size can be significantly smaller for the methanol route, which should serve to expand markets distant from the production areas. A significant increase in gas markets may be expected from the introduction of the new methanol synthesis process.

15589 **(BNL—39089) Liquefaction of natural gas to methanol for shipping and storage.** O'Hare, T.E.; Sapienza, R.S.; Mahajan, D.; Skaperdas, G.T. (Brookhaven National Lab., Upton, NY (USA)). Jul 1986. Contract AC02-76CH00016. 11p. (CONF-860904—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005389.

From International gas research conference; Toronto, Canada (8 Sep 1986).

The penetration of natural gas into distant markets can be substantially increased by a new methanol synthesis process under development at the Brookhaven National Laboratory. The new methanol process is made possible by the discovery of a catalyst that drops synthesis temperatures from about 275°C to about 100°C. The new low temperature liquid catalyst can convert synthesis gas completely to methanol in a single pass through the methanol synthesis reactor. This characteristic leads to a further major improvement in the methanol plant. As a result of process design factors made possible by the BNL catalyst, the plant required to convert natural gas to methanol is very simple. Conversion of natural gas to methanol requires two chemical reactions, both of which are exothermic, and thus represent a loss of heating value in the feed natural gas. This loss is about 20% of the feed gas energy, and is, therefore, higher than the 10% loss in energy in natural gas liquefaction, which is a simpler physical - not a chemical - change. The energy disadvantage of the methanol option must be balanced against the advantage of a much lower capital investment requirement made possible by the new BNL synthesis. Preliminary estimates show that methanol conversion and shipping require an investment for liquefaction to methanol, and shipping liquefied methanol that can range from 35 to 50% of the capital needed for the LNG plant and LNG tanker fleet. This large reduction in capital requirements is expected to make liquefaction to methanol attractive in many cases where the LNG capital needs are prohibitive. 3 tabs.

15590 **(NP—7770054) Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae.** Roettenbacher, L. (Technische Univ. Hamburg-Harburg (Germany, F.R.). Promotionsausschuss). 1985. 175p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87770054.

Using the example of ethanol production from S. cerevisiae, the author attempts to provide a basis for the operation and modelling of a novel bioreactor, i.e. the gas/solid fluidized-bed fermentation reactor. Since the performance of this reactor is largely determined by the fluidisation characteristics of the yeast pellets, an optoelectronic measuring system was developed for online monitoring of the fluidisation status. The kinetics of ethanol formation was determined by a novel method of measurement in which the reactions inside the reactor are continuously monitored by means of IR analyzers. The measurements showed a dependence of the ethanol formation rate on the glucose concentration as postulated by Michaelis-Menten. Product inhibition by ethanol can be described by a linear relationship between the specific ethanol formation rate and the ethanol concentration. The optimum reaction temperature was found to be T=36/sup 0/C. A mathematical model linking the mixing properties of the reactor with the transient reaction processes in the individual pellets as derived from the known laws governing the submerged system permits calculations of the ethanol, cell mass and CO/sub 2/ yields, i.e. of the ethanol production efficiency of the reactor. Optimisation of the fermenter performance requires a high solids circulation rate and optimum substrate distribution.

15591 **(PB—87-110532/XAB) Methanol production from indigenous resources in New York State.** (Science Applications International Corp., McLean, VA (USA)). May 1983. 406p. NTIS, PC PC E99.

15592 **(PB—87-110540/XAB) Methanol production from indigenous resources in New York State. Volume 1. Executive summary.** Wan, E.I.; Price, J.D.; Simmons, J.A. (Science Applications International Corp., McLean, VA (USA)). May 1983. 31p. NTIS, PC A03/MF A01.

See also Volume 2, PB87-110557; Also available in set of 3 reports PC E99, PB87-110532.

The three volumes of the report are: Executive Summary, Resource Assessment, and Technical and Economic Evaluation of Conversion Process Plants. The report presents a detailed analysis of New York State's methanol production capacity. Based on a technical and economic analysis of seven major indigenous resources and 11 conceptual methanol process plants designed by SAI, the report indicates that the production of methanol utilizing small-scale conversion plants (30-150-TPD methanol capacity) is technically feasible, but not yet economically competitive at current market prices (60 cents/gallon). In the long term, methanol fuel produced from several indigenous resources has the potential to contribute up to 7,000 TPD (693 million gallons/year) in liquid fuel supplies for New York State. The major resources available for methanol production will most likely be forest biomass, peat, landfill gas and unconventional shale gas.

15593 **(PB—87-110557/XAB) Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants.** Wan, E.I.; Price, J.D.; Simmons, J.A. (Science Applications International Corp., McLean, VA (USA)). May 1983. 167p. NTIS, PC A08/MF A01.

See also Volume 1, PB87-110540 and Volume 3, PB87-110565; Also available in set of 3 reports PC 99, PB87-110532.

The report includes the following: Introduction and summary; Status of methanol production technology; Process development and design; Cost estimates of methanol production plants; and Methanol production economics and financial analysis.

15594 **(PB—87-110565/XAB) Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants.** Wan, E.I.; Price, J.D.; Simmons, J.A. (Science Applications International Corp., McLean, VA (USA)). May 1983. 208p. NTIS, PC A10/MF A01.

See also Volume 2, PB87-110557; Also available in set of 3 reports PC E99, PB87-110532.

The report includes the following: Executive summary; Forest biomass; Agricultural residues; Energy plantations; Municipal solid wastes; Landfill gas; Sewage digester gas; Peat; Unconventional natural gas.

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 15599

15595 **(DOE/CE/63487—T2) Study of the feasibility of the commercial production of refuse derived fuel.** (Goldenrod Hills Community Action Agency, Walthill, NE (USA). Tri-County Council). 1986. Contract FG01-86CE63487. 79p. NTIS, PC A05. File Number DE87004906.

In Nebraska, approximately 3.5 pounds of domestic waste is generated per person per day. Most of this waste is not recycled but is being disposed of in either a landfill or an open dump. In the state of Nebraska there are 359 dumps being used by municipalities of less than 5000 people which have been exempt from state control since 1972 as the result of implementation of the Whitney Amendment. A survey at 68 of the 359 sites showed that most of the sites were not supervised and were engaging in activities which are either strictly regulated or prohibited in the state's 63 licensed landfills. The need does exist to develop a different method of disposing of municipal waste. Converting the refuse into biomass pellets would be one way to address this need. It is proposed to establish a business to be incorporated under the name of Progressive Fuels, Inc. and to manufacture refuse derived fuel (RDF) in northeast Nebraska.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 16183

1401 Resources And Availability

15596 **(PB—87-103636/XAB) New England solar energy atlas.** Cook, D.L. (Maine Univ., Orono (USA)). 25 Jul 1986. 82p. NTIS, PC A05/MF A01.

The book simplifies the available data on solar energy in New England. It is not intended as a guide on solar collector and/or home design; however, the information should aid the engineer, architect, or layman in using solar radiation as a renewable energy resource.

15597 **(SERI/TR—215-2948) The SERI Resource Assessment Project's plan for collecting spectral-solar-irradiance data.** Riordan, C.; Hulstrom, R. (Solar Energy Research Inst., Golden, CO (USA)). Dec 1986. Contract AC02-83CH10093. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87001134.

This report describes the Resource Assessment Project's plan for collecting spectral-solar-irradiance data. The plan presents a common approach and guidelines for collecting spectral-irradiance and related data to develop an archive that represents different climates and photovoltaic-collector modes. The plan describes the necessary measurements and documentation, the measurement approach, and the data flow/format from the collection sites to the archive.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 15584, 15586, 15590, 16423, 16805, 16809

15598 **(BNL—38870) Thylakoid phosphoproteins.** Coughlan, S.J.; Hind, G. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 25p. (CONF-860808—11). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003203.

From 7. international congress on photosynthesis; Providence, RI, USA (10 Aug 1986).

Thylakoid phosphoproteins were successively fractionated by (1) treatment of ^{32}P-labeled membranes with 1 M NaBr to remove superficial proteins; (2) extraction with octyl glucoside/cholate; (3) precipitation with ammonium sulfate; (4) size exclusion chromatography on BioGel P300, and (5) sucrose density gradient centrifugation. The detergent extract contained $<10\%$ of the original membrane-bound ^{32}P; it was enriched in cytochrome b/f complex and 64-kDa protein kinase. A 20-kDa protein which copurified with the cytochrome complex and was assumed to be the Rieske protein, was partially phosphorylated. The protein kinase, which phosphorylates itself in vitro, appeared on the sucrose gradient as a phosphoprotein, signalling that it had become labeled in the intact thylakoid. A phosphoprotein of $\sim$10 kDa which is seen as a product of directly radiolabeling the BioGel P300 extract, was found to differ from the well documented phosphoprotein of this approximate mass that appears in labeled thylakoids. 30 refs., 3 figs., 2 tabs.

15599 **(CONF-860405—7) Energy from biomass and wastes: 1985 update.** Klass, D.L. (Institute of Gas Technology, Chicago, IL (USA)). Apr 1986. Contract AC02-80CS83004. 102p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87004018.

From 10. annual symposium on energy from biomass and wastes; Washington, DC, USA (7 Apr 1986).

A comprehensive assessment of renewable technology options has shown that biofuels is the only option capable of making significant contributions to all energy sectors. The total contribution of renewable energy to primary energy demand in the USA today is about 6.8 quad/yr (3.2 million BOE/d); biofuels provide about 40% of the total. Research on SRIC trees and herbaceous and aquatic biomass has targeted specific species for development. Some of these species appear to be near economic feasibility as energy crops now. Commercialization of biomass and waste combustion systems has shown a spurt in growth because of the business opportunities offered by PURPA for cogeneration. Thermochemical gasification research on advanced technology systems has reached the point where scale-up is being considered. Commercialization of state-of-the-art technologies has slowed, but applications for small-scale producer gasifiers, particularly in developing countries, continue to expand. Thermochemical liquefaction research has concentrated mainly on high-temperature pyrolytic conversion methods that can increase yields and selectivities. Significant research achievements have been made in anaerobic digestion, but whatever its future as a large-scale source of methane, it is clear that digestion capacity will have to increase many-fold before biological methane can attain its potential. The reduction in lead content of gasolines by the EPA presents substantial marketing opportunities to alcohol fuel producers. If projections for ethanol fuel markets materialize, conversion of low-cost lignocellulosics will be necessary. Considerable research is now in progress to develop this technology. 256 refs., 32 tabs.

15600 **(CONF-8609228—1) Biological engineering for sustainable biomass production.** Shen, S. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004660.

From National forum on biodiversity; Washington, DC, USA (21 Sep 1986).

A new discipline has evolved in efforts to engineer photosynthetic production systems that produce biomass feedstocks efficiently, economically and with minimal adverse environmental impact. In this talk an overview is given of how biological engineering systems are designed to produce energy and novel material products within the framework of existing market infrastructure. Practical examples of biological engineering systems which employ components based on genetic engineering, species propagation, modern agricultural techniques, chemical engineering, and mechanical engineering are analyzed for worldwide materials application and environmental conservation. 9 refs., 6 figs.

15601 **(CONF-8609243—1) Illinois biotechnology resources: An overview.** Drucker, H. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004682.

From Governor's conference on science and technology in Illinois; Rosemont, IL, USA (3 Sep 1986).

Plant-based biotechnology covers a large number of biological and chemical fields. In most midwestern states agribusiness is either the number one or number two contributor to total state gross product. State and federal governments, industries, and land-grant universities all consider the development of new biotechnology-based agribusinesses as the core of a set of new industries. The midwest and Illinois have many of the principal users, processors, and chemical and biological purveyors of agribusiness. They will be the developers of new products and processes. In local universities, both private and public, and within the federal laboratories, such as Argonne and the Northern Regional Research Laboratory of the US Department of Agriculture, a research community is actively employed in many of the areas considered by industry as most critical to the development of new technologies. To facilitate the transfer of research results to industry, we have been developing, over the past two years, a consortium of major midwestern universities, research institutes, and agribusiness companies who consider biotechnology of some importance to their future. 4 figs., 1 tab.

15602 **(DOE/ER/03231—10) Effect of light and development of photosynthetic cells: Final report.** Gibbs, M. (Brandeis Univ., Waltham, MA (USA)). 1986. Contract AC02-76ER03231. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005183.

Green algae exposed to an anaerobic environment "adapt" to a hydrogen metabolism and can photooxidize H_2O to H_2 and O_2 as well as carbon compounds to H_2 and CO_2. The products from fermentation of chloroplastic starch included acetate, formate, ethanol, CO_2, H_2, glycerol, and lactate. Light caused an increase in H_2 and CO_2 and decreases in acetate and ethanol. Aerobically isolated algal chloroplasts adapted to a hydrogen metabolism where H_2 was evolved. The oxyhydrogen reaction was not detected in the chloro-

plasts. Acetate is photoassimilated anaerobically by Chlamydomonas cells to lipid, carbohydrate, CO_2, and H_2 with a stoichiometry indicating a light-dependent anaerobic glyoxylate cycle as the primary assimilatory pathway.

15603 **(DOE/JPL—1012-113) Environmental tests of metallization systems for terrestrial photovoltaic cells.** Alexander, P. Jr. (Jet Propulsion Lab., Pasadena, CA (USA)). 31 Dec 1985. Contract AI01-76ET20356. 78p. (JPL-PUB—85-86). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005419.

Seven different solar cell metallization systems were subjected to temperature cycling tests and humidity tests. Temperature cycling excursions were -50°C to 150°C per cycle. Humidity conditions were 70°C at 98% relative humidity. The seven metallization systems were: (1) Ti/Ag, (2) Ti/Pd/Ag, (3) Ti/Pd/Cu, (4) Ni/Cu, (5) Pd/Ni/Solder, (6) Cr/Pd/Ag, and (7) Thick Film Ag. All of the seven metallization systems showed slight to moderate decreases in cell efficiencies after subjection to 1000 temperature cycles. Six of the seven metallization systems also evidenced slight increases in cell efficiencies after moderate numbers of cycles, generally less than 100 cycles. The copper-based systems showed the largest decrease in cell efficiencies after temperature cycling. All of the seven metallization systems showed moderate to large decreases in cell efficiencies after 123 days of humidity exposure. The copper-based systems again showed the largest decrease in cell efficiencies after humidity exposure. Graphs of the environmental exposures versus cell efficiencies are presented for each of the metallization systems, as well as environmental exposures versus fill factors or series resistance.

15604 **(DOE/JPL—1012-120) Chemical bonding technology: Direct investigation of interfacial bonds.** Koenig, J.L.; Boerio, F.J.; Plueddemann, E.P.; Miller, J.; Willis, P.B.; Cuddihy, E.F. (Jet Propulsion Lab., Pasadena, CA (USA)). Jan 1986. Contract AI01-85CE89008. 52p. (JPL-PUB—86-6). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005424.

This is the third Flat-Plate Solar Array (FSA) Project document reporting on chemical bonding technology for terrestrial photovoltaic (PV) modules. The impetus for this work originated in the late 1970s when PV modules employing silicone encapsulation materials were undergoing delamination during outdoor exposure. At that time, manufacturers were not employing adhesion promoters and, hence, module interfaces in common with the silicone materials were only in physical contact and therefore easily prone to separation if, for example, water were to penetrate to the interfaces. Delamination with silicone materials virtually vanished when adhesion promoters, recommended by silicone manufacturers, were used. With the decrease in use of silicone encapsulates, and the increase in use of hydrocarbon encapsulates such as ethylene vinyl acetate (EVA), the need developed for adhesion promoters specifically developed for these new materials. The adhesion promoters being developed for EVA-type materials are based on organosilanes, which generate primary chemical bonds at the interface, that is, chemical bonding. These adhesion promoters are commonly referred to as "primers". This report describes the activities related to the direct investigation of chemically bonded interfaces.

15605 **(DOE/JPL—1012-121) The aging correlation (RH + t): Relative humidity (%) + temperature (°C).** Cuddihy, E.F. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Jan 1986. Contract AI01-85CE89008. 20p. (JPL-PUB—86-7). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005425.

An aging correlation between corrosion lifetime and relative humidity RH(%) and temperature t(a)C) has been reported in the literature. This aging correlation is a semi-log plot of corrosion lifetime on the log scale versus the interesting summation term [RH(%) + t(°C)] on the linear scale. This empirical correlation was derived from observation of experimental data trends and has been referred to as an experimental law. Using electrical resistivity data of polyvinyl butyral (PVB) measured as a function of relative humidity and temperature, it was found that the electrical resistivity could be expressed as a function of the term [RH(%) + t(°C)]. Thus, if corrosion is related to leakage current through an organic insulator, which, in turn, is a function of RH and t, then some partial theoretical validity for the correlation is indicated. This article describes the derivation of the term [RH(%) + t(°C)] from PVB electrical resistivity data.

15606 **(DOE/JPL—1012-123) Silicon production in a fluidized bed reactor: Final report.** Rohatgi, N.K. (Jet Propulsion Lab., Pasadena, CA (USA)). Apr 1986. Contract AI01-85CE89008. 70p. (JPL-PUB—86-17). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005427.

Part of the development effort of the JPL in-house technology involved in the Flat-Plate Solar Array (FDSA) Project was the investigation of a low-cost process to produce semiconductor-grade silicon for terrestrial photovoltaic cell applications. The process selected was based on pyrolysis of silane in a fluidized-bed reactor (FBR). Following initial investigations involving 1- and 2-in. diameter reactors, a 6-in. diameter, engineering-scale FBR was constructed to establish reactor performance, mechanism of silicon deposition, product morphology, and product purity. The overall mass balance for all experiments indicates that more than 90% of the total silicon fed into the reactor is deposited on silicon seed particles and the remaining 10% becomes elutriated fines. Silicon production rates were demonstrated of 1.5 kg/h at 30% silane concentration and 3.5 kg/h at 80% silane concentration. The mechanism of silicon deposition is described by a six-path process: heterogeneous deposition, homogeneous decomposition, coalescence, coagulation, scavenging, and heterogeneous growth on fines. The bulk of the grown silicon layer appears to be made up of small diameter particles. This product morphology lends support to the concept of the scavenging of homogeneously nucleated silicon. Excellent purity of the silicon product was obtained from an FBR equipped with a quartz liner. The product silicon had metallic contaminants less than the detection limits of spark source mass spectroscopy (e.g., Fe $\leqq$ 0.6 ppMa, Cr $<$ 0.02 ppMa, Zn $<$ 0.04 ppMa, Co $\leqq$ 0.1 ppMa). Solar cells fabricated from this pure silicon product showed encouraging results and the data are described in this report.

15607 **(DOE/JPL/957031—86-Final) Ink jet printing of silver metallization for photovoltaics: Final technical report for the period 10/1/84 through 9/30/86.** Vest, R.W. (Jet Propulsion Lab., Pasadena, CA (USA)). 30 Sep 1986. Contract NAS-7-100-957031. 226p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE87004786.

A computer controlled ink jet printing system for depositing any desired pattern of conductor lines was developed. Major changes were made in the ink supply and pressure control systems and in all electronic sub-systems for pulsing the spray head and driving the positioning table. A personal computer was integrated into the system. The preferred ink was identified, and the effects of ink viscosity, drop frequency, pulse voltage and nozzle diameter on line definition and ink flow rate were experimentally determined. A theoretical model for ink flow rate was developed, and the agreement between theory and experiment was determined. The characteristics of solar cells metallized by the ink jet printing system were evaluated. (LEW)

15608 **(N—87-12048) Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program.** Anspaugh, B.E.; Weiss, R.S. (Jet Propulsion Lab., Pasadena, CA (USA)). Nov 1986. 41p. (NASA-CR—179916; JPL-PUB—86-42; NAS—1.26:179916). NTIS, PC A03/MF A01.

The 1986 solar cell calibration balloon flight was successfully completed on July 15, 1986, meeting all objectives of the program. Thirty modules were carried to an altitude of 118,000 ft (36.0 km). The calibrated cells can now be used as reference standards in simulator testing of cells and arrays.

15609 **(PB—87-109153/XAB) Land suitability and availability for energy farming: a regional study Phase 2 report. Final report.** (Kingston, Reynolds, Thom and Allardice Ltd., Auckland (New Zealand)). Jul 1986. 202p. NTIS, PC PC E08/MF E01.

The report comprises Phase 2 of an extensive study into energy farming in the New Zealand context. It follows on from the

Phase 1 Report (NZERDC Publication p75), and is part of a research program aimed at assessing the potential contribution biomass conversion could make to meeting New Zealand's future transport fuel needs. The research considered the conditions necessary to sustain energy-farming implementation, the possible economic, social, and environmental implications, and developed and illustrated an assessment method suitable for adaptation in future regional studies.

15610 **(PNL—6141) Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement.** Stevens, D.J. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1986. Contract AC06-76RL01830. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005238.

Biomass is a major, renewable energy resource through out the world, and extensive research is being conducted by many countries on bioenergy technologies. In an effort to improve communications and cooperation in the area of biomass energy, several nations have agreed to a cooperative program of work under the International Energy Agency's Bioenergy Agreement (IEA/BA). Three areas of major importance have been identified including Short Rotation Forestry, Conventional Forestry, and Biomass Conversion. This document describes the 1987 Program of Work for cooperative activities in the area of Biomass Conversion. The background of the cooperation and descriptions of specific conversion projects are presented. Details of activity funding are also provided. 3 tabs.

15611 **(SAND—86-2181C) Progress in photovoltaic concentrator research.** Arvizu, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 11p. (CONF-870307—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003511.

From ASME/JSME/ISES solar energy conference; Honolulu, HI, USA (22 Mar 1987).

This paper reviews the recent progress in photovoltaic concentrator research. In the past 18 months, several exciting new developments have been reported. Record efficiency concentrator silicon cells have been reported at Stanford University, with 28% efficient high resistivity cells, and at the University of New South Wales, with near 25% efficient low resistivity cells. Both groups also report record 22% one-sun efficiencies for these cells. Compound semiconductor cells have also made advances. Research on multijunction devices has led to a mechanically stacked concentrator cell with near 27% efficiency. Module improvements in commercial designs have taken the form of reduced cost and better component reliability. In addition, current research emphasis is on the development of new prototype modules that use the recent laboratory cell advances. Array efforts have centered around improving the tracking and control subsystems in accuracy, durability, and cost. Today, concentrator systems in high insolation areas are being offered at prices near $4/W/sub p/ ac for large MW sizes and at prices below those of flat plate systems ($8/W/sub p/) in hundred kW sizes. This paper will review these achievements and discuss the potential for concentrator technology to become a viable cost-effective bulk electrical power option.

15612 **(SAND—86-7051) Silicon solar cells with polysilicon contacts.** Christel, L.A. (SERA Solar Corp., Santa Clara, CA (USA); Sandia National Labs., Albuquerque, NM (USA)). Jan 1987. Contract AC04-76DP00789. 70p. NTIS, PC A04/MF A01; GPO Dep. File Number DE87005619.

A concentrator cell contact technology with improved minority carrier recombination properties was developed. Polycrystalline silicon (polysilicon) deposited by low pressure chemical vapor deposition and doped by phosphorus furnace diffusion was used in conjunction with a low resistivity base line n + /p silicon concentrator cell process. Test cells with contact coverages of 5, 10, 20 and 40% fabricated on low resistivity substrates showed saturation current densities which increased with increasing contact coverage when simple metal contacts were employed. With polysilicon contacts, the saturation currents were lower and decreased slightly with increasing contact coverage. The data suggest that the effective recombination velocity at the polysilicon/silicon interface is very low. The use of a chemically grown interfacial oxide beneath the polysilicon resulted in a small additional improvement. It is suspected that the saturation current of the best cells is dominated by the base component. Open circuit voltages of 645 to 650 mV were obtained on 0.17 Ω-cm float zone cells using contacts with a 2000 A layer of polysilicon and an interfacial oxide grown by RCA clean. Contact resistance values of 1 to 5 x 10^{-4} Ω-cm^2 were typical for polysilicon contacts doped by diffusion. Values as low as 5 x 10^{-5} Ω-cm^2 were obtained using rapid thermal annealing.

15613 **(SERI/SP—232-3079) Microalgae culture collection, 1986-1987.** Barclay, W.; Johansen, J.; Chelf, P.; Nagle, N.; Roessler, P.; Lemke, P. (Solar Energy Research Inst., Golden, CO (USA)). Dec 1986. Contract AC02-83CH10093. 153p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87005578.

The SERI Microalgae Culture Collection provides a repository for strains identified or developed for mass culture biomass production and makes these strains readily available to the research community. The strains in the collection have been selected for their potential in biomass fuel applications, and many produce significant quantities of cellular storage lipids. All of the newly added strains have been recently isolated by SERI and its subcontractors in organized screening programs. Many have been tested in outdoor mass culture systems, and several have demonstrated excellent performance as biomass producers. The strains added to the collection this year have been isolated from inland saline waters and marine waters. We believe that the strains in this collection can provide a source of extremely useful organisms, both for laboratory experimentation and for mass culture research. Most of the strains are currently nonaxenic. Again this year, cultures will be shipped free of charge to interested researchers. An important function of the culture collection catalog, in addition to listing the available strains, is to provide culture and performance data for each of the organisms. By collecting a summary of the requirements and characteristics of these organisms, we hope to allow requestors of cultures to begin productive research with a minimum of preliminary work on culture techniques.

15614 **(SERI/STR—211-3053) Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986.** Cape, J.A.; Fraas, L.M.; McLeod, P.S.; Partain, L.D. (Chevron Research Co., Richmond, CA (USA); Solar Energy Research Inst., Golden, CO (USA)). Nov 1986. Contract AC02-83CH10093. 85p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87001133.

This report presents results of research on multi-band-gap solar cells. Investigators demonstrated controlled p-doping by carbon using TMGa, eliminating a need for Mg or Zn-doping. High-quality GaSb films were grown on substrates using TEGa and TESb. An EBIC-Schottky barrier technique was developed to characterize threading dislocations to qualify graded film structures. Higher film growth rates with more efficient Group-V utilization were achieved using a thermal cracker. A unique epitaxy technology, vacuum chemical epitaxy (VCE), was developed further. VCE results in good film uniformity from wafer to wafer and utilizes toxic gases much more sparingly and safely and expensive metal-alkyls more efficiently than conventional MOCVD. For some applications, it may be possible to avoid the most toxic gases altogether. These are significant advantages for safe, cost-competitive production of III-V devices in high volume. It was shown that high-quality solar cells can be fabricated using VCE.

15615 **Superlattice photoelectrodes for photoelectrochemical cells.** Nozik, A.J. (to Dept. of Energy, Washington, DC). US Patent 4,634,641. 6 Jan 1987. Filed date 3 Jul 1985. vp.

This patent describes a photoelectrochemical cell apparatus, comprising first photoelectrode means for injecting charge carriers into an electrolyte and second electrode means for injecting oppositely charged carriers into the electrolyte. The first electrode means includes a superlattice semiconductor.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 15597

15616 (SAND—85-7018/1) Evaluation of international photovoltaic projects: Volume 1, Executive summary. Eskenazi, D.; Kerner, D.; Slominski, L. (Meridian Corp., Falls Church, VA (USA); Sandia National Labs., Albuquerque, NM (USA)). Sep 1986. Contract AC04-76DP00789. 48p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87005178.

A comprehensive review and financial analysis are provided for photovoltaic power systems for remote applications in developing countries. Volume I, the Executive Summary, provides an overview of all findings; Volume II, the Technical Report, covers the methods of analysis used and the results obtained. Five application areas are included: water pumping, communications, vaccine refrigeration, lighting and home power, and multi-use systems. Findings are based on qualitative reviews of more than 2700 systems in 45 countries. Information was collected from published reports, questionnaires, and interviews with key experts. Site visits were not within the scope of this evaluation. The intended audience of this report are development agency officials, manufacturers, and users. Based on "lessons learned" from past projects, recommendations are provided for project implementation. In addition, financial analyses allow decision makers to use their own assumptions to obtain a first-order indication of the financial attractiveness of photovoltaic systems for each application. This report also provides industry with an assessment of product performance and suggested areas for additional improvements.

15617 (SAND—86-0272C) PVFORM Version 3.2: a PV simulation program for mini and micro computer systems. Second version. Menicucci, D.F. (Sandia National Labs., Albuquerque, NM (USA)). [1986]. Contract AC04-76DP00789. 12p. (CONF-870373—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002052.

From National conference on microcomputer applications for renewable energy; Honolulu, HI, USA (3 Mar 1987).

PVFORM is a new photovoltaic (PV) system simulation program that integrates improved modelling techniques into a simplified program that can be run on computers ranging in size from a mainframe to a personal computer. PVFORM is designed to simulate the hourly performance of a PV flat-plate grid-interactive, stand-alone or hybrid system for a one year period. The code is based on simple but accurate approaches to modelling the insolation in the plane of the array, array thermal behavior, and power production portions of a PV system. This paper briefly discusses the theory and operation of the major features of PV system modelling and describes how these features have been integrated into the PVFORM model. Also included are results of some of the SNLA field tests being used to verify the accuracy of the PVFORM grid-interactive model. A major portion of the paper is devoted to describing applications of the PVFORM model to the design, testing, and evaluation of PV systems including some examples of how to use PVFORM to optimize the configuration of stand-alone PV/battery systems.

1407 Solar Thermal Power Systems

15618 (BMFT-FB-T—86-087) Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report. Becker, M.; Dunker, H.; Bucher, W.; Kalt, A.; Sharan, H.N.; Wehowsky, P.; Stahl, D.; Meinecke, W.; Franzke, G.; Leuchs, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.); Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany, F.R.)). Dec 1986. 372p. (In German). NTIS (US Sales Only), PC A16/MF A01. File Number DE87751310.

The goal of the technology program 'Gas-cooled Solar Tower Plant' (GAST), which is carried out in the framework of the bilateral common project between the Federal Republic of Germany and Spain (duration from 1981 to end of 1986), is the determination of technical and economic reliability of the solar specific components heliostat, receiver and hot gas pipes. On the basis of a 20 MW lead concept, technical investigations and laboratory tests were carried out. Experiments, taking local and environmental conditions into consideration, are in progress at the test facilities on the Plataforma Solar in Almeria, Spain. To assess the test results as well as to design future GAST plants with different power and economic optimizations, sufficient auxiliary technical systems with computer programs were developed. Comparing the different systems such as solar tower plants, other solar plants (Farm, PV, Wind) and conventional plants (oil, coal, nuclear), the main investigation is concentrated on the different solar tower plants. The above mentioned different solar plants are defined technically and economically in such a way that the approximate yearly energy production as well as the specific energy costs can be calculated (cash value method, price basis of 1984, start of work: 1990). All different solar plants are considered as first plants. Due to meteorological reasons, California was chosen as the comperative site. The results and analyses of the technological program determine that the GAST concept is technically realistic and can be realized for electric power generation as well as for the utilization of solar thermal heat for high temperature processes. With 88 refs., 94 tabs., 101 figs.

15619 (DOE/JPL/1060—96) Solar Stirling receiver alternatives for the terrestrial solar application. Stearns, J. (Jet Propulsion Lab., Pasadena, CA (USA)). 30 Apr 1986. Contract AI04-80AL13137. 30p. (JPL-PUB—86-13). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005431.

Concept studies have been completed for four dish-Stirling receivers: the solar only and thermal storage receiver, each of which is either directly coupled or indirectly (heat pipe) coupled to the Stirling engine. The results of these studies are to be applied to systems benefit/cost analysis to determine the most desirable development approach.

15620 (SAND—86-8187) 10 MWe Solar Thermal Central Receiver Pilot Plant control system description. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA); Sandia National Labs., Livermore, CA (USA)). Dec 1986. Contract AC04-76DR00789. 147p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE87005582.

This report describes the control system for the 10 MWe Solar Thermal Central Receiver Pilot Plant located near Barstow, Ca. The plant, called Solar One, is a cooperative activity between the Department of Energy and the Associates: Southern California Edison, the Los Angeles Dept. of Water and Power and the California Energy Commission. This report provides an overview of the plant control system including the rationale for the design approach and the configuration which resulted in response to program requirements.

15621 (ESA-TT—61) Measurement of radiation intensity at the solar tower plant SSPS/CRS of the IEA in Spain. Brinner, A. (European Space Agency, 75 - Paris (France)). Jan 1986. Translated from Strahlungsintensitaets-Messung am Solarturmkraftwerk SSPS/CRS der IEA in Spanien Stuttgart, West Germany. (DFVLR-FB—85-36; ETN—86-98246). 42p. NTIS, PC A03/MF A01; original German version avail. at DFVLR, Cologne, West Germany DM 15.

The Kendall MK9 radiometer was selected to measure the radiation intensity on the IEA SSPS/CRS solar tower plant in Spain. The measuring signal was applied to calibrate a video camera used for measurement of power density distribution in the aperture of the solar absorber. The measurement results were used to show a relationship between the gray values of a video picture of the ASR receiver under radiation and the absolute radiation intensity measured at three points so as to calculate the absolute irradiation in MW. The tests show good reproducibility and high accuracy. The conversion factors were applied to calculate the flux distribution, the maximum flux and the ASR receiver efficiency.

1409 Solar Thermal Utilization

15622 **(ORNL—6359) PCMSOL: Simulation code for a passive solar structure incorporating phase change materials.** Drake, J.; Geist, A.; Martin, J.; Serbin, C.; Solomon, A.; Tomlinson, J.; Grodzka, P.; McCormick, P.; Price, J.; Brown, S. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 40p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87005292.

In order to study the optimum properties, utilization and economics of phase change materials (PCM) in a direct gain passive solar structure a computer simulation, PCMSOL, has been developed. This program, modeling a one room home, permits the incorporation of PCM's and/or other high thermal mass materials in the walls. The theory and basic relations used in the code are given. Some sample runs are discussed. The program is validated by comparison with data from an experimental passive solar structure in Huntsville, Alabama.

15623 **(PB—87-109161/XAB) In-situ performance of solar water heaters: a testing programme. Final report.** (Synergy Applied Research Ltd., Wellington (New Zealand)). May 1986. 63p. NTIS, PC PC E04/MF E01.

The objectives of the study were to (1) design an experimental and monitoring program to determine the in-situ performance of the SWH systems commonly being installed in the field, (2) conduct a comprehensive literature search and to design experiments to determine the performance of the state of the art equipment, i.e., to give an indication of future performance, and (3) design systems instrumentation and research methodology required to provide meaningful long-term performance and systems-reliability data.

1410 Solar Collectors And Concentrators

15624 **(N—87-11838) Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats.** Gulino, D.A. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 22p. (NASA-TM—88874; E—3281; NAS—1.15:88874; CONF-870133—3). NTIS, PC A02/MF A01.

From 25. AIAA aerospace sciences meeting; Reno, NV, USA (12 Jan 1987).

Silver mirror samples with protective coatings were subjected to a stream of 27 microns alumina particles to induce pinhole defects. The protective coating consisted of a layer of aluminum dioxide over silver followed by a layer of silicon dioxide over the alumina. Samples were prepared on both graphite-epoxy composite and fused quartz substrates. After exposure to the hard particle stream, the samples were exposed to an oxygen plasma environment in a laboratory plasma asher. The effects of both the hard particles and the oxygen plasma were documented by both reflectance measurements and scanning electron microscopy. The results indicated that oxidative damage to the silver reflecting layer continues beyond that of the erosively exposed silver. Oxidative undercutting of the silver layer and graphite-epoxy substrate continues in undamaged areas through adjacent, particle damaged defect sites. This may have implications for the use of such mirrors in a space station solar dynamic power system.

1420 Heat Storage

REFER ALSO TO CITATION(S) 16421

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

15625 **(DOE/ID/12543—2) Low-temperature geothermal assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah.** Budding, K.E.; Sommer, S.N. (Utah Geological and Mineral Survey, Salt Lake City (USA)). 1986. Contract FG07-84ID12543. 48p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004787.

Exploration techniques included the following: (1) a temperature survey of springs, (2) chemical analyses and calculated geothermometer temperatures of water samples collected from selected springs and wells, (3) chemical analyses and calculated geothermometer temperatures of spring and well water samples in the literature, (4) thermal gradients measured in accessible wells, and (5) geology. The highest water temperature recorded in the St. George basin is 42°C at Pah Tempe Hot Springs. Additional spring temperatures higher than 20°C are at Veyo Hot Spring, Washington hot pot, and Green Spring. The warmest well water in the study area is 40°C in Middleton Wash. Additional warm well water (higher than 24.5°C) is present north of St. George, north of Washington, southeast of St. George, and in Dameron Valley. The majority of the Na-K-Ca calculated reservoir temperatures range between 30° and 50°C. Anomalous geothermometer temperatures were calculated for water from Pah Tempe and a number of locations in St. George and vicinity. In addition to the known thermal areas of Pah Tempe and Veyo Hot Spring, an area north of Washington and St. George is delineated in this study to have possible low-temperature geothermal potential.

15626 **(GB—55) Heat flow and regional groundwater flow in the United Kingdom. Investigation of the geothermal potential of the UK.** Gale, I.N.; Downing, R.A. (British Geological Survey, Keyworth. Geothermal Resources Programme). 1986. 22p. British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ.

The area-weighted mean background heat flow in the United Kingdom is about 52mW/m^2, but values range from less than 40 to more than 120mW/m^2. The most pronounced heat flow anomalies are associated with granites where the regional heat flow is supplemented by high heat production from the decay of radioactive isotopes. Significant regional anomalies also occur in major sedimentary basins in the East Midlands of England, in Hampshire, in Gloucestershire and in the Midland Valley of Scotland. Thermal springs in Somerset, South Wales and Derbyshire are caused by the deep circulation of meteoric waters in the Carboniferous Limestone. They give rise to small thermal anomalies of local significance and occur in areas that are not part of the regional anomalies.

1502 Geology And Hydrology Of Geothermal Systems

15627 **Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada.** Flynn, T.; Ghusn, G. Jr.; Trexler, D.T. (Univ. of Nevada, Las Vegas). *Geo-Heat Center Quarterly Bulletin;* 8: No. 2, 3-6, 17(Win 1984). Contract FC03-80RA50075.

The Moana geothermal area, located in southwest Reno, is the largest single low- to moderate-temperature geothermal resource in Nevada presently employed for direct-use applications. Approximately 150 individual wells, representing a total estimated investment of $5 to $7 million, are presently used to provide heat and hot water to more than 130 private residences, several churches and two large motels. Although most of the wells are constructed to meet the heating needs of individual homes, a large-scale district space heating system, designed to supply heat to 60 houses from a single well, is now being developed. Usable temperatures range from 50 to 99 C; well depths range from 60 to 400 m. Development of the resource has been largely unregulated and questions dealing with reported reservoir temperature and water level declines, loss of artesian flow, and fluid disposal have recently surfaced. In October, 1982, a geologic and hydrologic research program began that was designed to provide detailed geothermal reservoir data to present or prospective developers. The program combines geophysical, geochemical, and geological surveys of the Moana resource area with a drilling program for 5 monitor/observation wells. Data from this program are supplied directly to developers as well as state and local government agencies to provide for prudent resource development. This paper summarizes the program elements and describes the present status. 9 references.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 15625, 15625

15628 (GB—56) Further investigations of the UK heat flow field (1981-1984). Investigation of the geothermal potential of the UK. Wheildon, J.; Gebski, J.S.; Thomas-Betts, A. (British Geological Survey, Keyworth. Geothermal Resources Programme). 1985. 19p. British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ.

Twenty nine new determinations of the vertical component of conductive terrestrial heat flow have been made. The results of this study modify the boundaries of the high heat flow belt across northern England. The belt is not continuous, but consists of a series of isolated regions of above average heat flow. In southern England, three strategically located heat flow sites have demonstrated that the high heat flows in south-west England and the Hampshire Basin occur as separate anomalies and are not linked as a single belt, as was formerly supposed.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 15630, 15630

1520 Geothermal Data And Theory

15629 (NP—7770053) Experimental investigations of the reaction between albite and acid hydrothermal solutions. Toepfer, U. (Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Bio- und Geowissenschaften). 22 May 1985. 143p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE87770053.

To extract geothermal heat from granite or gneiss, a heat exchange medium must be injected into the rock strata. Flooding with an aqueous solution causes the mineral to react with the solution, inducing dissolution of the mineral or a formation of secondary mineral phases. The dissertation investigates these two possibilities. The author describes the experimental set-up (pH meter, scales, autoclaves, X-ray diffractometer, atomic absorption spectrometer, SEM, and energy-dispersive X-ray analyzer), the experimental acquisition of data, the initial material, and the dissolution of albite at different pH and with additions of different elements. Investigations of the secondary mineral phase are reported, and experimental results are compared. Hints are given on the geothermal application of the experimental findings, e.g. the required acidity of the exchange medium and the necessary time of contact with the rock.

15630 (SAND—87-0073C) Magma energy extraction. Dunn, J.C.; Ortega, A.; Hickox, C.E.; Chu, T.Y.; Wemple, R.P.; Boehm, R.F. (Sandia National Labs., Albuquerque, NM (USA); Utah Univ., Salt Lake City (USA)). 1987. Contract AC04-76DP00789. 9p. (CONF-870136—4). NTIS, PC A02. File Number DE87005068.

From 12. workshop on geothermal reservoir engineering; Stanford, CA, USA (20 Jan 1987).

The rate at which energy can be extracted from crustal magma bodies has an important influence on the economic viability of the magma energy concept. Open heat exchanger systems where fluid is circulated through solidified magma offer the promise of high energy extraction rates. This concept was successfully demonstrated during experiments in the molten zone of Kilauea Iki lava lake. Ongoing research is directed at developing a fundamental understanding of the establishment and long term operation of open systems in a crustal magma body. These studies show that magma solidifying around a cooled borehole will be extensively fractured and form a permeable medium through which fluid can be circulated. Numerical modeling of the complete magma energy extraction process predicts that high quality thermal energy can be delivered to the wellhead at rates that will produce from 25 to 30 MW electric.

16 TIDAL AND WAVE POWER

1608 Wave Energy Converters

15631 (ETSU-WV—1668(P3)) Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy. (Edinburgh Univ. (UK); UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.; Department of Energy, London (UK). Wave Energy Steering Committee). 1986. 76p. British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ.

Experimental investigations into the effects of adding appendages to the Edinburgh spine model are described. The appendages comprised corners, fins, decks - plastic foam layers added to the top surface of a squared-off spine to give a range of freeboard, skins - plastic foam layers wrapped round the spine to increase radius, and harbours -rectangular plates mounted normal to the spine. The decks were tested in a range of mixed seas in the freeboard experiments. The other configurations were tested for their response to wave frequency and angle, and for their performance in the 46 spectra representing the annual wave climate off South Uist. Tests were performed at two spine stiffnesses. The plain spine was tested under the same conditions for comparison.

17 WIND ENERGY

15632 Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). 540p. (CONF-850834—). American Wind Energy Assoc., 1516 King St., Alexandria, VA Alexandria, VA.

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

This book presents the papers given at a conference on wind turbines. Topics considered at the conference included resource assessment, wind tunnel testing, vertical axis turbines, wind turbine generators, aerodynamics, airfoils, wind loads, Darrieus rotors, economics, legislation, regulations, environmental impacts, national and international programs, fatigue testing, and horizontal axis turbines.

1701 Availability (climatology)

15633 A low cost and easy to reproduce anemometer for basic wind data acquisition. Borja, M.A.; Parkman, P.; Caldera, E. (Instituto de Investigaciones Electricas, Apartado Postal 475, C.P. 62000, Cuernavaca, Morelos). pp 397-401 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

At the Instituto de Investigaciones Electricas (Electrical Research Institute) of Mexico, a commercial calculating machine was used to design a low cost anemometer which is programmable by the simple introduction of a constant of proportionality at the beginning of system's operation. With this equipment one can also get the wind direction in a coded form in 8 different directions. The equipment is called APTI-2-IIE and has 30 day-information capacity. Since it is actually a pulse counter, it is very suitable to the data acquisition of other variables. The equipment has proved to be reliable during continuous operating tests under different and rigorous climatological conditions. Its reproduction, calibration, installation and operation are simple.

15634 Wind characteristics, northwest Texas region. Gilmore, E.H. (Alternative Energy Institute, West Texas State Univ., Canyon, TX). pp 406-410 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

A wind monitoring system of ten stations has been developed over the period 1978-81 and spans a 250,000 sq km(100,000 sq

mi) region of northwest Texas. Wind speeds have been sampled at 10, 20, and 50 meters at frequencies of 0.5 and 1 Hz. Four locations had overall average power densities at 50 meters in the range from 414 to 450 watts/sq meter. These values are about 50% greater than those measured at the next group of sites, namely, Dalhart, Stanton, and Childress. The four locations with highest average power density values lie nearly on a straight line from the southwest Texas panhandle to its northeast corner. Nighttime average windspeeds generally exceed day values at 50 meters, but there is little difference in average power density values. Wind shear exponents range from 1/9 to 1/6 during daylight at these four stations to about twice these values at night. Combined day night values are from 1/6 to 1/4, which are somewhat larger than the values 1/7 to 1/6 most often used.

15635 **Significance of upper air meteorological conditions in Altamont Pass wind resource assessment.** Burda, T.J.; Wilson, J.W.; Hiester, T.R.; Germain, A. (Stone & Webster Engineering Corp., Boston, MA). pp 402-405 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Because a long-term surface wind data base is not available in the Altamont Pass area, it is difficult to judge whether wind data collected at a particular site are representative of the long-term condition. Using a multiple regression technique, a model was developed which predicts the average daily wind speed at a site in Altamont Pass as a function of the zonal (west-east) wind component at approximately 550 m (1800 ft) above Oakland, CA and the daily maximum San Francisco surface air temperature. The model was applied to the July long-term National Weather Service data base to estimate the monthly average wind speed at the Altamont site dating back to 1953. A discussion of the monthly dependence, limitations, confidence limits, and applicability of the model to estimate the long-term representativeness of the Altamont site wind data is presented.

15636 **Missing data: How does it affect the accuracy of key wind statistics.** Baker, R.W.; Chu, P.S. (Wind Resource Assessment Lab., Dept. of Atmospheric Sciences, Oregon State Univ., Corvallis, OR). pp 391-396 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Accurately evaluating the wind power potential at potential wind power development sites is often complicated by the fact that the hourly wind speed records collected are incomplete. Missing data is an unfortunate 'fact of life' in wind resource assessment. Rarely are the annual data recovery rates above 90% and typically they are in the 75-85% range. The question then arises as to the representativeness of the collected data to give an accurate estimate of the actual wind statistics. This paper focuses on the impact of missing data on estimating the wind power resource. Complete wind speed sets of hourly data over a one year period are analyzed at 10 sites. Wind speed data are systematically removed from the data sets and the mean statistics of wind speed, power density, and estimated wind turbine generator (WTG) energy output from the incomplete and complete data sets are compared on an annual basis. The Critical Levels for data recovery at each site are calculated to give an accuracy within +-5%, +-10% and +-15% to the actual mean value with a 90% Confidence Limit. There was a good relationship between the Critical Levels and the variations in the mean monthly wind speed, power density, and estimated WTG energy output (i.e., the annual Coefficient of Variation, COV). The analysis of the mean wind speed COV's at several wind power development areas revealed that the Critical Levels of data recovery ranged from 72% at Goodnoe Hills to 83% at Altamont Pass. With respect to the mean annual power density and WTG energy output the Critical Levels need to be at least 10 percentage points greater that the mean annual wind speed Critical Levels.

1704 Economics

REFER ALSO TO CITATION(S) 15650, 15665

15637 **Beyond 1985: New market development.** Ceci, R.M. (Remy Ceci Consulting, Sacramento, CA). pp 237-241 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The market for investments in wind energy is changing rapidly. Whether in response to the potential loss of the tax credits and other financial incentives, or driven by the increasing sophistication of the investment community, wind turbine manufacturers and windfarm developers have had to reassess traditional investment vehicles that no longer meet the needs of a growing number of capital resources. In addition, new markets, both domestic and abroad, offer new marketing options that must be addressed with increased flexibility and creativity by the companies aggressively seeking those markets. This paper discusses several of the options available to today's wind energy companies as they meet the challenges inherent in this volatile marketplace.

1705 Environmental Aspects

REFER ALSO TO CITATION(S) 15642, 15643

1706 Wind Energy Engineering

15638 **Wind energy activities in Sweden.** Engstrom, S. (National Energy Administration, Stockholm). pp 348-352 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

In the 1975-1984 period the national Swedish wind energy program concentrated on the construction and evaluation of two large WECS, Maglarp 3 MW and Nasudden 2 MW. A total of MSEK 265 of Government-funds has been used, of which some MSEK 180 was devoted to the prototypes and the remaining MSEK 85 for basic research and general evaluation activities. Substantial sums also were invested by the manufacturing industry. By the end of 1984 the National Energy Administration of Sweden completed an evaluation report on wind power. The main results are presented here. In February 1985 the Government presented a bill on the future energy policy which also covered the future for wind power in Sweden. Presently negotiations concerning the financing of the next development step are taking place.

15639 **Canadian wind energy R & D.** Chappell, M.S. (Div. of Energy, National Research Council, CA). pp 363-368 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The current status of Canadian wind energy research and development projects is outlined. Resource assessment based on long-term meteorological data is substantially complete. Work continues on analytical and wind tunnel techniques for siting. Technology development remains focused on the Darrieus vertical axis wind turbine. Performance prediction methods are well advanced but better understanding and mathematical modelling of dynamic stall is required. Structural dynamic modelling and fatigue stress analyses have progressed to within acceptable accuracies. 50 kW grid-coupled and wind-diesel field trial projects continue to provide valuable operating experience to both researchers and utilities. Prototype 125 kW and 500 kW VAWT's are undergoing comprehensive performance and structural testing at the Atlantic Wind Test Site. A large waterpumping HAWT is also being evaluated. Components for the experimental 4 MW VAWT are being fabricated and the civil and electrical engineering works at the site in Quebec are nearly completed. The government has recently decreed that NRC will cease activity in wind energy R & D. It is hoped that

beyond April 1986, other Canadian government agencies will continue certain thrusts of the current program.

15640 **Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon.** Wade, J.E.; Baker, R.W.; Butler, N.G.; Duncan, A. (Wind Resource Assessment Lab., Oregon State Univ., Corvallis, OR). pp 417-422 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

A wind farm feasibility study was conducted on a 1500 acre site near Cape Blanco, Oregon. This study had five main elements: preliminary site analysis; engineering, environmental impact analysis; licensing; permitting and administrative process and meteorological assessment. This paper describes the meteorological element of this study. The field assessment methodology utilized wind measurements from fixed location meteorological towers, mobile towers and kite anemometers to evaluate spatial and temporal variations in the wind. Turbine performance and energy estimates were evaluated for five different wind turbines. Estimates of energy output for the various wind turbines are compared. Estimates of mean speed on the site when referenced to the 8 year period of record at Cape Blanco were found to be 16% lower than estimates based on a 35 year record that included data from the Coast Guard Light Station at Cape Blanco. This trend of weaker winds from 1976 to 1983 was also noted in several other locations in western Oregon.

15641 **Wind energy utilization status of research and development in the Federal Republic of Germany.** Windheim, R. (Nuclear Research Establishment Julich, P.O. Box 19 13, D-5170 Julich). pp 381-386 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Most of the Wind Energy R & D activities of the Federal Republic of Germany are covered by the Program for Energy Research and Technologies of the Minister of Research and Technology. It follows the general objective to develop reliable and economically viable wind energy conversion systems and to stimulate the commercialization of wind power. Realistic site evaluation shows that the wind energy potential in the Federal Republic of Germany is notable. Many projects are or were supported by the program with a total amount of more than 200 mill. DM. They follow two aims: 1. Electricity generation by small scale (up to 50 kW), medium scale (several 100 kW) and large scale machines (several MW); and 2. Adaptation of small and medium scale machines for special applications. The status of R & D projects is presented. It supports the objective to utilize the wind as one promising way in the scenario of renewable energy sources.

15642 **Windfarm noise issues and impacts.** Allen, G.M. (Michael Brandman Associates, Inc., Costa Mesa, CA). pp 315-322 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Despite its benefits as an alternative energy source, commercial windfarming is losing acceptability because of latent noise and land use compatability conflicts. In the San Gorgonio Wind Resource Area, three issue areas arose: (1) measurement techniques; (2) prediction assumptions and methodology and; (3) acceptability levels. The authors' recommendation for measuring a turbine's noise level for prediction purposes is multifaceted. Measurements should be made at various azimuth positions under a range of operating conditions at distances calculated as functions of the dimensional characteristics of the turbine. A-weighted and one-third octave band measurements should be made with standard equipment with the microphone placed at five feet above ground level. Narrowband measurements in the low frequency and infrasound region should be made with the microphone at ground level to minimize the effects of pseudo noise. The data will still often require processing in a Fast Fourier Transform Analyzer to distinguish turbine from pseudo or background noise. Noise prediction is accomplished via distributed array computer modeling incorporating propagation parameters. To use the model as a planning tool, the authors recommend a divergence loss factor of 20 log of the distance ratio, an atmospheric absorption factor based on the turbine's frequency spectra and local humidity/temperature conditions; and a ground absorption loss of 0.5 - 1.0 dB per 1,000 feet depending on whether it is a horizontal or vertical axis turbine. Acceptability levels should be attached to the ambient noise because of the wind-affected character of a wind resource area. Allowable noise should be no greater than 6 dB less than the ambient and low frequency, impulsive noise should not exceed NASA criteria. Pure tone components should not exceed the California Model Noise Control Ordinance specifications.

15643 **Permitting windfarms in California: Environmental impacts, local regulations, developer responsibility.** McClendon, R.E.; Duncan, R.A. (FloWind Corp., Pleasanton, CA). pp 305-314 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

This presentation is an insight of the state of the industry in regards to the ability of the industry in regards to the ability of the industry to work with the local government and the community it serves. The areas of investigation are: what the local regulations were when wind energy got its start; what the environmental concerns were of the local government and the community it serves; what the developers' responsibilities were to the local community; and who else was the developer responsible to. As the infant industry started developing wind farms the public attitude began to change and their concerns were voiced to the local government. Hence today the development atmosphere has changed and the developers are beginning to take a more active role in shaping their destiny by working with the citizens and the local governments by: addresses the environmental issues; working more closely with the local government; and meeting with citizen groups to reconcile differences.

15644 **Environmental noise considerations for the siting and operation of wind energy farms.** Shepherd, K.P.; Hubbard, H.H. (The Bionetics Corp., Hampton, VA). pp 299-304 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The basic phenomena of noise generation, noise propagation and the effects of noise are reviewed for wind turbine generators in single machine and multiple machine configurations. The roles of individual machine noise spectra and directivity patterns are discussed along with pertinent frequency weighted noise metrics. Special attention is given to the effects of the wind. The results of sensitivity studies are described to indicate the impact of machine sizes and geometric arrangements on the noise level predictions. Example noise contour calculations are presented to illustrate the effects of changes in machine size and spacing, row length, number of rows and total number of machines as a function of distance and direction from the arrays.

15645 **Wind park electrical testing by Southern California Edison.** Yinger, R.J. (Southern California Edison Co., Rosemead, CA). pp 294-298 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

As part of the Southern California Edison Company (SCE) wind energy program, the electrical characteristics of private developer-owned wind parks and their effects on the local SCE transmission and distribution system are being investigated. Measurements of megawatts, megavars, voltage and current are being made at selected wind park interconnect points. From these data, wind park output fluctuations, voltage regulation and power factor are determined. Synchronous operation of wind turbines are also being investigated. Future studies will include more analysis of existing data and measurements at more wind parks in other regions.

15646 **Integrating wind energy into the electric utility system.** Stock, J.; Cheng, M.L. (Southern California Edison Co., Advanced Engineering Dept., Research and Development, P.O. Box 800, Rosemead, CA). pp 287-293 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

This paper discusses some of the dynamics of wind power generation as it may impact Southern California Edison's planning, transmission and operating functions. The use of a peak power ratio for planning and the effect of dispersed wind energy generating stations (WEGS) are described. Short-term wind power fluctuations are evaluated and related to Edison's operating system capabilities. A wind power prediction model is discussed and a preliminary method for converting wind speed to regional power output is presented.

15647 **Progress and problems in wind energy research and development in Hawaii.** Neill, D.R.; Takahashi, P.K. (Hawaii Natural Energy Institute, 2540 Dole St., Holmes Hall 246, Honolulu, HI). pp 265-279 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Hawaii has one of the best proven wind energy resources in the world. There has been significant progress in the past year by the utilities and wind farm developers toward developing this great wind resource. But wind energy development in Hawaii has not been as aggressive as in California for a number of reasons that are discussed in this paper. This paper reports on the progress in wind energy development in Hawaii, highlighting accomplishments such as the installed wind farms to date and those that should be completed by the end of 1985 (e.g. two 9 MW wind farms at Kahuku, Oahu, using Westinghouse's 600 kW machines and DAF-Indal 500 kW VAWTs, two 10 MW wind farms at South Point, Hawaii, one consisting of Carter Wind System 250 kW machines, and the other using Danish wind machines, etc.). A report is given on the various actions of the utilities, decisions by the Hawaii Public Utilities Commission and the State Legislature, and an avoided cost methodology study by the State of Hawaii Department of Planning and Economic Development. The second part of the paper describes the research programs underway at HNEI on utility interface problems, exploring the role of diesel systems, and other activities, which include a wind energy battery storage pilot demonstration project, studies on other wind energy storage options such as pumped-storage-hydro, compressed air, hydrogen, and research on wind forecasting, and non-utility-dependent uses of wind power.

15648 **Review of standards/codes of practice related to safety and reliability of wind energy conversion systems.** Beurskens, J.; Frandsen, S.; Lundsager, P.; Pedersen, B.M. (Netherlands Energy Research Foundation ECN, Petten). pp 255-264 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Within the framework of the IEA-R&D-WECS Programme a working group involved in establishing recommended practices for wind turbine testing and evaluation has reviewed draft standards/codes of practice related to safety and reliability of WECS. The review was made on the basis of documents from formal national standards committees at the stage of development reached by April 1985. The review is based mainly on documents from Canada, Denmark, Federal Republic of Germany, The Netherlands, USA and Sweden. The documents used in the review are listed and some comments are given. Some standards are based on codes of practice that are currently being enforced by licensing or other authorities, thereby reflecting the design of WECS built today. A general overview of safety standards is given.

15649 **Pacific Gas and Electric Company's wind energy program results.** Smith, D.R.; Steeley, W.J.; Ilyin, M.; Hillesland, T. Jr. (Pacific Gas and Electric Co., San Ramon, CA). pp 280-286 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Pacific Gas and Electric Company (PG and E) has gained valuable experience with wind generation of electricity both by operation of its own 2.5 megawatt turbine, and as the host utility for the output of the privately owned wind farms in Altamont Pass, the largest collection of wind turbines in the world. Since September 1982 PG and E's Department of Engineering Research has been involved in a program to evaluate the Solano wind turbine's performance and environmental impacts. The program was cosponsored by the Electric Power Research Institute. Some of the results are highlighted in this paper. PG and E also tracks the performance of the Altamont wind farms, comprising over 4000 turbines with an installed capacity of about 350 MW. These farms include turbines ranging in rating from 40 to 400 kW and rotor diameters from 10 to 31 meters (33 to 103 ft.). Overall capacity factor has improved each year so far, and results through the first half of 1985 are reported. The performance of the Altamont wind turbines during system peak load times are discussed. Other trends and developments of the Altamont turbines taken as a composite power plant are also reported.

15650 **Wind farm economics from a utility perspective.** Pepper, J.C. (Pacific Gas and Electric Co., San Francisco, CA). pp 248-254 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Purchases from third-party wind developers make up a portion of PG & E's planned resource additions over the next 10 years. Avoided costs, the price paid for energy and capacity deliveries from third-party developers, play a very important part in wind farm economics. Actual avoided costs are shown for the last few years to illustrate their fluctuation. Their calculation is explained. Correlations between the energy output in the peak, partial-peak and off-peak time period are shown by month for 1984. This gives an indication of the pattern of wind energy production within the PG & E system. The resource planning methodology used within PG & E to forecast the amount of wind development by Qualifying Facilities (QFs) from the QF's perspective is explained and the sensitivities to installed cost, wind speed and tax credits are shown.

15651 **Wind energy activities in Denmark.** Nielsen, P. (DEFU, Lundtoftevej 100, DK-2800 Lyngby). pp 353-358 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

So far, the design and erection of the two 40 m/630 kW turbines (A and B) at Nibe has been the main achievement of the Danish wind power programme. In January 1984, three new wooden blades were installed on the B turbine, and since then this machine has operated with higher availability than ever (86%). Recently five turbines of modified Nibe B design (40 m/750 kW) were ordered by ELKRAFT to be built on Zealand with commissioning in 1986. In Jutland, ELSAM is going to install an improved and enlarged version of Nibe B (60 m/2 MW). The scheduled time for commissioning is mid-1987. Between 1200 and 1400 small-scale turbines have been installed in Denmark in recent years. By the end of 1984, the corresponding number of Danish wind turbines in the USA was about 2000 units, and around 2500 are expected to follow in 1985.

15652 **Optimizing output of a wind-driven alternator using microprocessor control.** Soderholm, L.H. (Iowa State Univ., Ames, IA). pp 343-347 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Efficiency of a wind-system rotor is dependent on the ratio of the rotational or tip speed to the wind speed driving it. Unless some provision is made for varying the rotor speed or pitch, optimum tip-speed/wind speed (TS/WS) ratios normally will not be maintained over a wide range of wind speeds, and less than optimum power output will result. Fixed-pitch rotors offer a number of

design and cost advantages but will not provide maximum power output over a wide range of wind speeds unless some provision is made to optimize the TS/WS ratio. An approach for performance improvement of fixed-pitch wind system using microprocessor control of an alternator field is described. Data indicate that such an approach can result in power-output improvements of 12% to 47% over normal operation for a typical wind system and thus enhance the economic viability of fixed-pitch wind systems for many applications.

15653 **Structural dynamics considerations in wind turbine rotor design.** Stoddard, F.S. (Pioneer Wind Power, Inc., Amherst, MA). pp 337-342 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

This paper briefly describes an analytical method for the simple calculation of wind turbine rotor blade dynamic loads due to wind speed, gravity, and perturbations due to yaw rate, crosswind, and wind shear. The method has been developed from the classical helicopter approach of modeling the fundamental blade structural frequencies in flapping and lead-lag with equivalent hinge-spring blade models. An algebraic approach is taken in order to gain physical insight into the dynamic behavior of wind turbine rotors. An example calculation is presented for a 12-meter diameter rigid rotor. The paper ends with a discussion of blade coning, cyclic load response and input, and rotor yaw stability.

15654 **Modal testing in the design evaluation of wind turbines.** Lauffer, J.P.; Carne, T.G. (Sandia National Labs., Albuquerque, NM). pp 323-332 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—). Contract AC04-76DP00789.

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Modal testing of wind turbines can be fairly difficult because placing transducers on tall structures and providing low frequency excitation create problems. Moderate-size turbines are 100 to 200 feet tall, and their modal frequencies are very low, 0.1 to 5.0 Hz. In the mini-modal concept, only a limited number of response measurements are used in conjunction with a reasonably accurate finite element model to determine the modal parameters. Several techniques of low frequency excitation were explored, including impact, wind, step-relaxation, and human input. In tests using the mini-modal concept with human excitation, modal frequencies of large turbines have been determined in less than one day. As one application of these techniques, a prototype turbine was tested and two modal frequencies were found to be very close to integral multiples of the operating speed, which would cause a resonant condition. The design was modified to shift these frequencies, and the turbine was retested to confirm the expected changes in the modal frequencies.

15655 **A proposed method for processing data on wind energy conversion systems testing.** Borja, M.A.; Borja, R.E.; Parkman, P.A. (Instituto de Investigaciones Electricas, Apartado Postal 475, Cuernavaca, Morelos 62000). pp 333-336 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

At present, the "Method of Bins" for processing data on wind energy conversion systems testing is being used as a generalized method. But anybody working in this field has experimented the problem of overevaluation of the low part of the power curve which is evident when trying to determine system efficiency, especially in variable speed wind turbines with high hysteresis near the cut-in speed. In order to reduce this spurious problem, it was considered using the "most probable power" method previously proposed, finding that it is possible to combine both methods with their particular advantages in order to obtain a more reliable power curve. In this paper the authors present a brief discussion about the two mentioned methods, the proposed combined method, an application example for a particular system, and an activity program to determine the validity of the proposed method.

15656 **The Netherlands wind energy research and development program.** Boreel, L.J.; Hack, R.K. (Management Office for Energy Research PEO, P.O. Box 8242, 3503 RE Utrecht). pp 375-380 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The Netherlands wind energy R&D program covers the period 1976-1990 and consists of four programmes. The first programme (1976-1981) has proven the feasibility of 1000 MW wind power for the Dutch electricity supply, and the second programme (1981-1984) resulted in the elements required for a reliable and cost-effective wind energy technology. The third programme (1985) is dedicated to programming the fourth period (1986-1990) which will concentrate on bringing together technology, industry and market in order to realize 1000 MW of wind power in the year 2000. Since 1984 wind energy R&D is managed by the Management Office for Energy Research PEO. This independent organization controls the funds allocated by the Ministry of Economic Affairs to the development of Renewable Energy in the Netherlands.

15657 **Wind speed variability in the California Altamont Pass area.** Holets, S.H. (Pacific Gas and Electric Co., 215 Market Street, San Francisco, CA). pp 411-416 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Pacific Gas and Electric Company (PG&E) measured hourly wind data at eight hilltop sites in the California Altamont Pass area during the summer of 1981. Considerable spatial and temporal variability of hourly wind speeds occurred between all eight monitoring sites with the degree of variability being a function of atmospheric stability. During early morning hours, two flow regimes often occur in the Altamont area: high wind speeds persist in the northern and central Altamont while speeds are light and variable in the southern Altamont. However, during PG&E's peak load hours (1200 to 1900 PDT), the entire Altamont area is normally in the same general flow regime. During this period, topographic influences cause average wind speed differences between sites to occasionally exceed 3.5 meters per second and speeds at hilltop sites to normally decrease with height above ground. Because wind speed variability likely occurs also in the vicinity of each of the eight monitoring sites, it is concluded that site specific speeds should neither be considered representative of widespread areas of the Altamont nor be used for estimating any detailed wind energy potentials at nearby locations.

15658 **The EEC Wind Energy R&D Programme, 1985-1988.** Rasmussen, B. (ELSAM, DK-700 Fredericia). pp 359-362 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The paper puts the Wind Program into perspective, regarding both the total R&D Program of the EC and the previous wind programs. The situation in Europe for the market and for the research/industry is analyzed, thus giving the background and the purpose of the program.

15659 **The Italian programmes for wind energy.** Giaquinto, L.; Taschini, A.; Calovolo, M.; Montanari, P.; Rega, A.; Zappala, F. (ENEA, Rome). pp 369-374 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Started relatively late (1979-1980) and with a cautious approach, the Italian effort in the field of wind energy has slowly but continuously progressed to constitute a consolidated and realistic national program. The different public and industrial operators have contributed to create a favorable scenario for a physiologic growth of the wind energy sector: several projects and studies have been (and are being) carried out, under the sponsorship of the Ministry of Industry, by ENEA, ENEL and Industries. The projects developed, or under development in Italy, cover the whole range

of size and applications, from small systems for electrification of rural users to large WTG to be used in connection with national grids. This paper describes the role of the various operators, the various programs and the global strategy of development and exploitation of the wind energy in the framework of the national energy policy.

15660 **Wind energy technology research in the U.S.** Ancona, D.F. (U.S. Dept. of Energy). pp 387-390 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

In 1985, the U.S. Department of Energy formalized its multi-year research program plan for wind energy. The plan sets forth specific goals and objectives for wind technology development which will guide the Federal research program over the next five years. Basic research will be aimed at improving the understanding of the atmospheric physics of the wind, the wind/turbine rotor interactions, and the structural interactions of the entire wind turbine system. Results of the research will advance the technology and aid industry in designing more reliable, cost-effective wind systems.

15661 **Development of the load spectrum for the Westinghouse WWG-0600 wind turbine.** Long, R.S. (Westinghouse Electric Corp., Advanced Energy Systems Div., P.O. Box 10864, Pittsburgh, PA 15236). pp 440-445 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

One of the most challenging problems faced during the design of a large horizontal axis wind turbine is the definition of an appropriate load spectrum. This load basis must encompass steady state operating loads including the effects of turbulence and yaw error, as well as loads due to high winds, startup, shutdown, and emergency shutdown operations. Extensive analyses of the Westinghouse Wind Turbine system were performed using the REXOR II aero-elastic program. The overall model includes the effects of teetering, wind retardation, tower degrees of freedom and three blade deformation modes. These analyses provided detailed loads for the design of major components under a variety of steady state and transient operating conditions. They also provided a basis for assessing the effects of different shutdown scenarios and machine setpoints on component loads. The results of these analyses are presented.

15662 **Preliminary report on the field testing of latest model Campbell Chinese-type windmill.** Campbell, J.S.; Obendorf, D.L. (Conservation Engineering Co., Orinda, CA 94563). pp 434-439 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Since 1974, James Campbell has worked to develop a modern version of the over 2,000 years old Chinese traditional windmill. Now his latest model, a result of many step by step advances and improvements, is completely set up on the campus of Solano Community College. There, with the help of a grant from Pacific Gas and Electric Company, it is now being debugged and it will be thoroughly tested for reliability, durability and cost effectiveness. This windmill is still a research and development project. The authors principle aim is to determine, if possible, whether it can become a competitive commercial product now or possibly in the future. The paper briefly covers the windmill's principle of operation, some important design features, and some troubles recently encountered with the latest model. In addition, some previously observed advantageous features are listed.

15663 **Price targets for wind turbines in utility applications.** Goodman, F.R. (Electric Power Research Institute, Palo Alto, CA). pp 242-247 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

In late 1984, EPRI completed an assessment of the wind turbine size/price relationship. The scope of this effort covered turbines from the small, 50-kW class up to megawatt-scale wind turbines. The approach used was to design utility wind power stations using different turbine sizes. The stations were all sized for comparable overall annual energy production. The turbine price target was treated as an unknown which was to be calculated for each case studied. Each wind power station was assigned a value for energy at the station bus. Using this overall energy value target and known costs for the balance of station (i.e., the wind power station exclusive of the turbines), together with carefully selected assumptions about wind regime, station losses, wind turbine operating characteristics, and operation and maintenance costs, the residual or allowable price of the turbines (or turbine price target) was calculated for each case. Hence, a set of results emerged showing what a user can afford to pay for the turbines in a utility wind power station, as the turbine size varies. This process was repeated for several energy value targets.

15664 **Development of a maintenance free 10 KW windgenerator.** Bautz, R.A. (Panesa S.A., 2035 Corcelles). pp 423-428 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

Wind is a natural, clean, inexhaustible and independent source of energy. It's wide diffusiveness and the possibility of a direct conversion in any other form of energy makes it interesting for local uses such as water pumping, heating or electrical power supply in remote sites. PANENSA windgenerator systems are the result of long years of R & D in collaboration with the Swiss Federal Institute of Technology in Lausanne. First, a horizontal axis upwind and twin bladed machine with a permanent magnet claw type rotor was constructed. After acquiring sufficient experience on this windgenerator and to better serve the market, a new machine was developed, the WINDWATT 10 KW based on the following considerations: to use the tested technology of the 5 KW windgenerator to reduce development costs; to develop a reliable system with the least possible maintenance for remote sites; and to convert the wind energy into electricity with a maximum of efficiency by relying on specifically developed equipment.

15665 **The Taylor 'V' Type Vertical Axis Wind Turbine: Current status.** Boyle, G.A.; Robotham, A.J.; Sharp, D.J.; Taylor, D.A. (Alternative Technology Group, Open Univ., Milton Keynes, MK7 6AA). pp 429-433 of Wind power 85. Alexandria, VA; American Wind Energy Assoc. (1985). (CONF-850834—).

From WINDPOWER '85; San Francisco, CA, USA (27 Aug 1985).

The paper describes the current status of the Taylor 'V' Type Vertical Axis Wind Turbine (VAWT). The turbine which resembles the letter "V", has an inherent simplicity and a number of innovative features which could lead to an inexpensive machine, both in terms of capital and maintenance costs. An aerodynamic performance prediction model, VAWTTAY6, for this wind turbine has been developed and enhanced, and the effects of certain parameter changes on overall machine performance are compared. The results show that power coefficients in excess of 0.30 are achievable. The turbine is also self-starting even at relatively low solidities. Wind tunnel test results are presented for models with two blades, which match closely the values predicted by VAWTTAY6. Experiments on a V-VAWT model with blades which have variable pitch tips have also been carried out and their effects on performance is discussed. An experimental 8.8 metres diameter prototype is being designed and is described.

20 ELECTRIC POWER ENGINEERING

REFER ALSO TO CITATION(S) 15798

15666 **(CONF-870203—1) Simulation of geomagnetic currents induced in a power system by magnetohydrodynamic electromagnetic pulses.** Rackliffe, G.B.; Crouse, J.C.; Legro, J.R.; Kruse, V.J. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Systems Technology Div.). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002422.

From Power Engineering Society winter meeting; New Orleans, LA, USA (1 Feb 1987).

This paper quantifies the quasi-dc currents induced on a power system by a simulated magnetohydrodynamic pulse (MHD-EMP). The determination of the quasi-dc currents is based upon the similarity between the effects of MHD-EMP and the impact of geomagnetic storms. The paper highlights how the methodology to calculate geomagnetic-induced currents from solar storms was modified to calculate the currents induced by a MHD-EMP event. After specification of the MHD-EMP environment and the selection of a power system to study, the quasi-dc currents induced in the power system were calculated.

15667 **(GEPP-TIS—366d) A bibliography and author index for electrical discharges in vacuum (1897-1984).** Miller, H.C. (General Electric Co., Largo, FL (USA). Neutron Devices Dept.). 20 Aug 1986. Contract AC04-76DP00656. 344p. NTIS, PC A15/MF A01; 1; GPO Dep. File Number DE87004165.

This bibliography covers the field of electrical discharges in vacuum, comprising both electrical breakdown in vacuum and vacuum arcs. A brief review section lists some review papers which would be helpful to the novice in this field. The bulk of the paper consists of bibliographic listings, arranged by year of publication and alphabetically by first author within each year. An author index refers one to all papers authored or coauthored by a particular person. There are 3154 papers listed through December 1984.

15668 **(ORNL/Sub—85-28611/1) Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report.** Burrage, L.M.; Hettwer, P.F.; Howells, E.; Veverka, E.F.; Smith, I.D.; Nelson, J.K.; Dugan, R.C. (McGraw-Edison Power Systems Div., Franksville, WI (USA). Thomas A. Edison Technical Center; Oak Ridge National Lab., TN (USA)). Feb 1987. Contract AC05-84OR21400. 114p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87005727.

Concern has been expressed with respect to the dielectric integrity of today's power systems and power system components when subjected to steep front, short duration (SFSD) impulse. Impulses of this type are characterized by voltage rise times of 10 to 250 ns and durations to several μs. A review of the literature on SFSD impulse and its associated impact on the insulating systems used in power system apparatus was completed. SFSD impulse was found to be the result of several sources including both lightning and nuclear electromagnetic pulse (EMP) and may contribute to the so called anomalous behavior or failure of electrical apparatus. The insulation systems used in power system apparatus were ranked with respect to vulnerability to SFSD impulse. The power insulating systems believes to be at greatest risk are the porcelain/air structural insulation (line insulation) and the paper/oil/enamel systems (transformers). Events reported in the open literature as anomalous behavior or failure were cataloged and characterized. The bibliography is available as a separate report.

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 15327, 16216, 16225

15669 (CONF-8412124—Exc., pp 41-49) **Technical requirements on refuse-fuelled heat- and-power plants.** Vogg, H. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R.). Jun 1986. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

Abfallwirtschaft in Rheinland-Pfalz. No. 3.

A waste incineration plant must primarily fulfill the task of waste management and therefore have a high degree of safety of operation, i.e. usually have at least 7,000 service hours per year. Usually it is installed in 2, sometimes even 3 separate incineration units to ensure its permanent readiness. Another requirement of today is the utilization of its heat. Mostly a part of the heat is transferred to power, another part fed into district heating by designing the plant as a dual-purpose power plant. In addition to these 2 main tasks, recently there are increasingly severe prescriptions relating to the protection of the environment which have to be adhered to when operating a waste incineration plant.

15670 **(CONF-8503273—Summ.) Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation.** (Hessisches Ministerium fuer Wirtschaft und Technik, Wiesbaden (Germany, F.R.)). 1985. 175p. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

This documentation summarizes the speeches held on a symposium which was organized in Frankfurt on 22 March 1985 on the occasion of the international trade fair 'sanitation-heating-air conditioning'. The central point is the present level of techniques and the possibilities of using cogeneration systems and combustion engine heat pumps. Requirements of profitability are discussed, as well as concepts of energy and short-distance heat supply. Finally, a reference list of cogeneration systems, numerous examples of existing systems, and operational experiences are given. (HAG).

15671 (CONF-8503273—Summ., pp 22, Paper 2) **Systems of short-distance heat supply in modular technique.** Heyne, K.G. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

The author refers to dual purpose power plants consisting of modular components. After taking a critical view back to the systems of the first generation, the progressive modular technique is introduced at the examples of individual modular components. After having also taken a look at the costs, examples of modularized short-distance heat supply systems are discussed, forecasting their future chances. (HAG).

15672 (CONF-8503273—Summ., pp 10, Paper 3) **Strengths and weaknesses of cogeneration units - application of small and medium size cogeneration plants in short-distance heating systems.** Franer, F. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

This article is mainly based on the comparison of strengths and weaknesses of cogeneration systems with regard to their application in short-distance heating systems. As strengths, the author counts especially their profitability, their being near to the consumers, their availability, risk diversification, and the low energy consumption. Besides the resistance on the market, hazards to the environment and various conflicts of interests and learning processes are seen as weaknesses. (HAG).

15673 (CONF-8503273—Summ., pp 6, Paper 4) **Field of application of cogeneration plants with large engines.** Taubert, G. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

The author deals with the large engines being used in cogeneration systems with high performance. After a general explanation,

the decoupling of utilizable electrical energy, the relation of power and heat, the temperature level of the utilizable heat, and the fuels are discussed. Permanent operation of large engines is also dealt with briefly. (HAG).

15674 (CONF-8503273—Summ., pp 15, Paper 5) **Supply-technical, operational, and energy-political assessment of cogeneration plants.** Laistner, H. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

This report deals with the objectives of an offensive local energy-policy and the possibilities of using cogeneration systems. After a brief technical description, district heating and short-distance heating, special ways of application, and the operation of the cogeneration plant are explained. Finally, the author refers to aspects of profitability, including also legal problems. (HAG).

15675 (CONF-8503273—Summ., pp 14, Paper 6) **Short-distance heat supply in Rottweil with cogeneration systems and heat pumps.** Rettich, S. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

The report mainly refers to the short-distance heat supply in the city of Rottweil. In the beginning, the supply volume is shown, followed by the technical solution, and the design of the heating power plant. In addition to investigating whether to prefer heat or power, the author also deals with questions of profitability. After refering to energy savings and mineral oil substitution, the effects of the cogeneration system on the environment are discussed. (HAG).

15676 (CONF-8503273—Summ., pp 13, Paper 7) **Short-distance heat supply in the Ruelzheim recreation center by means of a cogeneration unit and heat pumps.** Jacobowsky. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

This report describes at the example of the short-distance heat supply in a community the excellent possibilities which can be utilized in the planning and designing of energy supply systems. In addition to design and function of the system, the economical advantages are described. Furthermore, the planned profitability is dealt with, giving also suggestions for other possibilities of application. (HAG).

15677 (CONF-8503273—Summ., pp 24, Paper 8) **Experiences made during planning and operation of a big cogeneration unit in a municipal facility.** Wolters, H. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

The author describes the cogeneration unit of Luenen, especially emphasizing the planning and operation. After a brief description of the system, the report deals with the design criteria, the call for tenders, the power and heat credits, and the optimization of energy supply. Furthermore, the maintenance contracts and insurances are discussed in addition to the operational experiences and personnel selection and assignment. (HAG).

15678 (CONF-8503273—Summ., pp 21, Paper 9) **Combination technique: Gas heat pump/cogeneration unit - tandem heating power heat pumps, energy concept of Siemens AG.** Regner, R. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

The author introduces a modern energy concept which is based on the combination of a heat pump and a heating power plant. In addition to the planning, the application of modern modules is discussed. The energy concept of "heat-water-power" and its profitability are discussed. Furthermore, three tandem heating power heat pumps-producer units are discussed, pointing out their positive ecological and economical features. (HAG).

15679 (CONF-8609154—3) **The mechanism of particulate adhesion in coal-fired gas turbine systems.** Ahluwalia, R.K.; Im, K.H.; Hajduk, J.C. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004674.

From Joint PETC/METC direct utilization AR and TD contractors review meeting; Warrendale, PA, USA (22 Sep 1986).

This report presents a model for the adhesive behavior of flyash and focuses on: internal parameterization, e.g., mechanical constitutive relation; external parameterization, such as velocity, temperature, and the effect of glue. The process of deposit buildup, i.e., fouling, depends upon the fundamental interaction between particles and surface (Zimon 1982). Physically, a particle encounters a wall and elastically bounces off; or adhesive energy exceeds rebound energy and the particle sticks; or the particle adheres but later leaves the surface due to drag forces; or the particle adheres but later leaves the surface due to spallation, i.e., other incoming particles erode the surface and knock off the adhering particle. The adhesive energy arises from: Van der Waal's surface-particle attraction; and electrical attraction due to charges on the particle and surface. The presence of moisture negates the contribution of the latter of these two. The rebound energy corresponds to the incoming kinetic energy minus the energy dissipated through: capillary forces due to liquid present on the surface, i.e., glue action; and plastic deformation of either the particle or the surface (embedding). 13 refs., 5 figs., 1 tab.

15680 (DOE/MC/19281—T1) **Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency.** Price, R.T.; Shah, Y.M. (PEDCo-Environmental, Inc., Cincinnati, OH (USA)). Mar 1984. Contract AC21-82MC19281. 160p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE86004249.

The purpose of this study was to determine the environmental, technical, economic, and legal/regulatory aspects of converting non-coal-fired utility boilers to concurrent or sequential firing of coal and natural gas for presentation in this manual. Technically, the burning of coal and natural gas in a boiler is not difficult, as the two fuels are quite compatible. The consensus of utility operators who have fired the two fuels simultaneously and sequentially in the same boiler is that the natural gas enhances the coal burning, improves boiler operation and reliability, and decreases maintenance costs. Most of these boilers in which coal and gas have been fired, however, were originally designed to burn coal or were units with liberal spacing between boiler convection tubes. Nevertheless, the comments of successful users of this approach are important because of the many boilers with complete or partial coal firing capability that are currently burning oil and have done so for years. It is hoped that this manual will encourage utilities to evaluate the benefits of coal/gas firing in situations where conversion to 100% coal firing is not feasible for technical, regulatory, or economic reasons. Although ascertaining the effects of coal/gas firing in a boiler specifically designed to burn oil and/or gas requires further testing, much of the information in this manual applies to these units as well as those originally designed for coal firing. The hope is that the conversion of these units would not only reduce emissions, but also that the gas portion of the fuel would make complete revamping of these boilers unnecessary for their successful conversion to coal-fired units. It is also possible that this approach could eliminate altogether the need for expensive flue gas desulfurization equipment or greatly reduce the cost of such equipment. 12 figs., 35 tabs.

15681 (EPRI-CS—4748, pp 1.1-1.19) **Current developments in diagnostic monitoring.** Scheibel, J.R.; Armor, A.F. (Electric Power Research Institute, Palo Alto, CA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

In the next 20 years, the utility industry will be faced with maintaining the integrity of power generation and supply with only a very limited number of new plant additions. The difficulty of financing new plants, the cancellation and deferment of many nuclear orders and the uncertain rate-of-growth of the industry, places increasing emphasis on the availability of the existing generation. In particular, many fossil units are approaching the limit of their design lives (typically 30-40 years) and present a challenge to utilities in extending life without impacting availability. It is in this current climate that the techniques of incipient failure detection are beginning to flourish. Early warning of component deterioration is seen as an essential part of any predictive maintenance program for fossil plants. Conversely, the absence of such techniques leads to sudden, and often catastrophic, equipment failure implying extended outages for repair and replacement. When faced with only one day additional downtime on a large unit, the capital cost of monitoring equipment is quickly exceeded so these monitors are viable devices for all utilities to consider. Turbine shaft, disc, or blade failures can be catastrophic, the result being major turbine-generator damage, long outage time and possible safety implications for plant personnel. 13 references, 13 figures.

15682 (EPRI-CS—4748, pp 1.19-1.31) **Periodic vibration monitoring at Georgia Power Company.** Fearing, H.A. (Southern Co. Services, Inc., Birmingham, AL). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

For many years, the Research and Development (R & D) Department of Southern Company Services, Inc., has used vibration analysis to diagnose machine problems at the generating plants of Alabama Power Company, Georgia Power Company, Gulf Power Company, and Mississippi Power Company. It is believed that vibration analysis also shows promise as a preventive maintenance tool that could reduce the number of machine failures and thereby increase plant availability. However, the R & D Department had no experience monitoring machine vibrations for preventive maintenance, and little information was available about the costs and benefits of such a program. Therefore, with the cooperation of Georgia Power Company, R & D initiated a pilot vibration monitoring program at Plant Bowen. The goals of this program are: (1) to determine whether a vibration monitoring program could successfully prevent machine failures; (2) to gain first-hand experience in the installation and operation of a vibration monitoring program at a power plant; and (3) to determine the costs and benefits of various monitoring strategies. With the experience from this program, R & D will have a measure of the effectiveness of vibration monitoring as a preventive maintenance tool. The evidence will be presented to systems plants, and R & D will provide expertise and support to plants interested in starting their own programs. 5 figures, 1 table.

15683 (EPRI-CS—4748, pp 1.33-1.56) **Benefits of switching from a manual to computerized vibration predictive maintenance system.** Catlin, J.B. Jr. (IRD Mechanalysis, Inc., Columbus, OH). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Vibration predictive maintenance started, perhaps, 30 years ago with portable instruments designed primarily to detect unbalance in machinery. Over the years, however, it was found that other defects such as misalignment, losseness and defective rolling element bearings could also be detected. As these predictive maintenance programs have become more valuable to industry in terms of increased machinery life, reduced machinery downtime, improved productivity, and reduced maintenance costs, they tended to expand in size, often including hundreds and even thousands of machines. Along with the increased effectiveness of these programs has come increased complexity: wider variety of measurement parameters, wider frequency ranges, more precision in measurement, and many more measurements to record and analyze. The net result has been a need for a substantial increase in manpower. As an alternate to increased manpower many industries have searched for ways to automate their programs. Until recently, automation has been limited to the use of automatic permanently installed monitor systems. Now, however, computer based systems have been developed which operate in a manner similar to manual periodic check programs which use portable instruments. The performance of these computer-based systems is discussed.

15684 (EPRI-CS—4748, pp 1.57-1.63) **Evaluation of alternative techniques for machinery vibration monitoring.** Shugars, H.G.; Moore, T.I. (Electric Power Research Institute, Palo Alto, CA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Electric utilities have for many years monitored equipment vibration to detect machinery failures. The approaches for monitoring machines has varied widely, from computer aided continuous monitoring to periodic hand held monitoring. EPRI has initiated a project to evaluate various machinery monitoring approaches and demonstrate the benefits, costs, and lessons learned from a planned machinery monitoring approach. The project will be completed through the development of a Utility Machinery Monitoring Guide that will address all aspects of planning and implementing a plant machinery monitoring program. This paper describes the Utility Machinery Monitoring Guide and how it will be developed. 1 table.

15685 (EPRI-CS—4748, pp 1.85-1.104) **San Diego Gas & Electric's vibration monitoring/reduction program.** Curran, R.P.; Diggs, R.S.; Linney, E.O.; Reguly, T.M.; Walker, L.E. (San Diego Gas & Electric Co., CA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The San Diego Gas & Electric Company's (SDG & E's) vibration monitoring program was started in 1971. Hand-held vibration meters were used to take vibration readings on equipment that already had problems. This type of monitoring continued until 1978 when a formal program was established to monitor plant machinery on a regular basis. SDG & E's present vibration program consists of three basic parts: monitoring, diagnostics, and balancing. The intent of the program is to reduce the number of mechanical equipment failures by early detection. This allows maintenance personnel the opportunity to schedule maintenance when they want to, and not when they have to. In addition, an attempt is made to operate the equipment at the lowest vibration level than can be cost-effectively achieved. The SDG & E's vibration monitoring reduction program is described. 9 figures.

15686 (EPRI-CS—4748, pp 1.105-1.122) **Start-up support and trouble shooting for multi-bearing machine.** Bowman, R.M.J. Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Practice has shown that the rotor bearing system may substantially influence running behavior of a machine. Not only do the bearings transfer the rotor-induced vibrations, they can also cause instability themselves. The running behavior of a machine has been evaluated mainly with the aid of frequency spectra obtained by means of vibration velocities are measured with the aid of a speed-sensitive pick-up, or relative displacements between shaft and bearing casing are established with an inductive pick-up. For optimum start-up support or in case of established bearing trouble, it is well-advised to conduct not only a dynamic measurement, but a static measurement as well and to process the test readings skillfully. Only this procedure permits plan indication of any anticipated or established difficulties. The procedure followed for start-up of a multi-bearing machine is described.

15687 (EPRI-CS—4748, pp 2.1-2.30) **Detection of incipient failure in vertical pumps.** Walter, T.J.; Shugars, H.G.; Wood, J.W. (Shaker Research Corp., Latham, NY). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper summarizes the planned scope of work and results to date of EPRI project RP2338-1, On-Line Monitoring and Diagnostics for Submerged Vertical Shaft Pumps. Also described are several experimental efforts that reinforce the need to accomplish the project goal, that of extending to vertical pumps the capability that now exists to monitor and diagnose problems with horizontal pumps. The project is based on iterative analytical and experimental efforts and is being implemented on three different types of vertical pumps typically found in power plants. Vertical pumps often operate for extended periods with vibration levels and signs of unstable operation that normally dictate immediate shutdown in most machinery. These conditions are often detected during off-normal operation by sensors mounted within the submerged portion of the pump. 13 figures.

15688 (EPRI-CS—4748, pp 2.31-2.50) **Diagnostic monitoring of axial flow fan bearings.** Tuten, J.M.; Kaiser, W.D.; Scheibel, J. (Battelle Columbus Labs., Columbus, OH). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper presents the results to date on an EPRI sponsored project to demonstrate the practicality of using bearing monitoring techniques to predict impending failures of rolling element bearings. Current methods and technology were reviewed and a monitoring methodology was selected and implemented on a number of in-service axial flow fan bearings. These bearings have been monitored for a period of 14 months during which time two bearings were removed from service due to indicated failure. Preliminary analysis of these bearings and correlation of the bearing condition with the monitoring system output are presented. 24 references, 11 figures.

15689 (EPRI-CS—4748, pp 2.51-2.70) **Detection of turbomachine blading problems using on and off-line monitoring.** Boyce, M.P.; Meher-Homji, C.B.; Focke, A.B.; Bowman, J.C. (Boyce Engineering International, Inc., Houston, TX). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper deals with on-line and off-line techniques to detect blade problems before they get to a failure mode. This is achieved by the use of spectrum analysis combined with aerodynamic blade loading analysis. These techniques can result in predictions which save major failures. This paper also discusses the complexities of blading problems for axial and centrifugal compressors and turbines. A case of surge related problems is discussed. A detailed case history of detection of a blading problem on a large single stage, axial flow expander using Fast Fourier Transform (FFT) vibration techniques is presented in detail. 9 references, 9 figures.

15690 (EPRI-CS—4748, pp 2.73-2.94) **Vibration signature analysis at Philadelphia Electric.** Frarey, J.L.; Scheibel, J. (Shaker Research Corp., Latham, NY). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Monitoring systems for rotating machinery are becoming widely accepted in industry, because their value has been proven in avoiding catastrophic failure. Most of these systems rely heavily on the judgement and experience of well-trained professional vibration analysts. The vibration analyst is the link that is needed between symptoms suggested by a relatively large amount of acquired data and a recommended course of action. In a current EPRI contract, RP 1864-1, Shaker Research Corporation (SRC) undertook the development of a computer-based machinery monitoring and diagnostic system that seeks to incorporate many of the analysis techniques that until recently involved labor-intensive skills possessed by a handful of experts. The intent of this particular program is to replace the vibration analyst up to the point where a cause-and-effect relationship can be established. That is, the human element would not be needed until after all the necessary data had been acquired, the unessential data filtered out - leaving only the significant data for processing, and these data reduced to create the major elements of a symptom-fault matrix. The focus of this work is to ensure that the kind of data needed for analysis is present in the system and that meaningful diagnostic decisions can be made based on the proper interpretation of the data. Once these parallel goals have been satisfied, automation of the decision-making process (i.e., the isolation of the fault) is a relatively straightforward task. 8 figures, 3 tables.

15691 (EPRI-CS—4748, pp 2.95-2.117) **On-line vibration monitoring at the United Illuminating Company.** Salomon, J.H.; Reeves, L.R.; McAnally, M.A.; Dukler, M.S. (United Illuminating Co., New Haven, CT). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

An automated system for on-line vibration monitoring of critical machinery in a power plant is described. The system is based on a minicomputer which acquires, processes and stores data from vibration sensors and from other sensors which measure machinery operating conditions. This system is the key element in a predictive maintenance program to increase plant availability through early detection, diagnosis and management of progressive failures in rotating machinery. Data are displayed on a high resolution color CRT under operator control. Display formats for machinery fault detection and diagnosis include vibration time series, spectra and orbits for current data; historical vibration and plant parameters may also be displayed for trend analysis. Other displays show current machine status and vibration levels in an easy-to-read format. During startups and rolldowns, vibration levels are displayed in real time along with data from previous startups or rolldowns for comparison. Historical and reference data are maintained on-line for quick access. Operator controlled functions are accessed through a simple menu structure so the system can be used by plant personnel with a minimum of training. This system has been in operation at United Illuminating Company's New Haven Harbor Station for more than one year. use of the system in the plant maintenance program is described. 11 figures.

15692 (EPRI-CS—4748, pp 2.119-2.142) **Turbine supervisory instrumentation.** Kruger, W.; Baxter, N. (Scientific Atlanta, San Diego, CA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

As the Power Generation Industry undergoes dramatic operational changes due to increased regulatory pressures and public opinion, renewed emphasis has been placed on the benefits and savings provided by Machinery Condition Monitoring. This paper describes the dramatic physical changes a large steam turbine undergoes while operating from turning gear to full load operations. Also discussed are the various machinery parameters, techniques and instruments currently being used to measure these changes, as well as a basic description of what these measurements mean. 10 figures.

15693 (EPRI-CS—4748, pp 3.1-3.17) **Water induction detection system: field testing.** Hurwitz, M.J.; Benedict, R.P.; Boles, D.G.; Lescheck, W.C.; McCloskey, T.H. (Westinghouse Electric Corp., Pittsburgh, PA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper describes efforts to develop an unmanned commercial water induction detection system suitable for providing adequate warning of impending water induction incidents in steam turbines. The field testing was primarily aimed at the protection of

low pressure turbines from water backups from feedwater heaters, however, most of the work also has application to higher pressure and temperature parts of the steam cycle. The monitoring system included active ultrasonics, newly developed fast thermocouples, and two electronic level gauge sensors. The sensor outputs are conditioned and presented to a minicomputer which records and analyzes the signals from the various systems and provides warnings of impending water events. The system was installed and operated over several months on the extraction lines of a low pressure feedwater heater at the Pennsylvania Electric Company's Homer City Generating Station. With rigorous attention to turbine protection, controlled water incidents were carried out under representative flow and thermodynamic conditions during normal operation of the power plant. Signatures from these controlled incidents were recorded, analyzed, and used to develop computer algorithms for unmanned monitoring. The system was then successfully tested in the operating power plant with additional controlled water incidents. During several months of unmanned monitoring the system detected and recorded two unexpected water incidents, thus providing valuable system responses under actual field conditions. Based upon this work, general specifications for a commercial configuration of a water induction detection system have been developed. 8 references, 10 figures.

15694 (EPRI-CS—4748, pp 3.19-3.30) **Monitoring of steam turbine environments for detection of stress corrosion cracking.** Chung, P.; Gayley, H. (Taiwan Industrial Technology Research Institute). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Stress corrosion cracking (SCC) has been a problem of considerable concern for many years as evidenced by many published reports. These references provide extensive further information on the experience gained world-wide concerning the stress corrosion cracking of steam turbine rotors. The studies in these references have examined the important of operating stresses, materials and environment on the SCC of turbine rotors. As a result of this work, actions have been taken to minimize cracking in current and future turbine rotors, but methods for complete protection from cracking have not been evolved. Based on this, detection of cracking and conditions which may lead to cracking, are of continuing importance. This paper describes equipment and test results which may contribute to early detection of steam turbine rotor SCC or the conditions leading to cracking. This work was sponsored by the Electric Power Research Institute. 8 references, 9 figures.

15695 (EPRI-CS—4748, pp 3.31-3.54) **On-line rotor crack detection monitoring system.** Imam, I.; Azzaro, S.H.; Scheetz, J.; Armor, A.F. (General Electric Co., Schenectady, NY). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Cracking of rotors in large steam turbines can be a significant problem for electric utilities because an undetected rotor crack may lead to major extended outage. An on-line rotor crack detection and monitoring system to detect and evaluate cracks in steam turbine rotors at an early stage, while the machine is operating under load, is being developed at General Electric under an EPRI contract. Both experimental and analytical approaches are being combined to develop this diagnostic system. The major tasks of the four-year project include the development of an analytical nonlinear rotor dynamics crack model and advanced signature analysis techniques, the development of a microprocessor-based multichannel on-line rotor crack detection monitoring system, and the performance of large-scale laboratory and field tests. This paper summarizes the activities of the first year and a half of the program. These activities include development and experimental validation of a 3-D finite-element rotor crack model, performance of the first large-scale laboratory tests, and development of a first-generation on-line rotor crack detection and monitoring system. A significant accomplishment was the successful detection of a fatigue crack in an on-line mode. The crack depth was 1% to 3% of the rotor diameter. The results of the first large-scale laboratory tests are discussed. Plans for the development of the prototype rotor crack detection system are outlined. 12 references, 19 figures.

15696 (EPRI-CS—4748, pp 3.55-3.68) **On-line diagnosis of turbine-generators using artificial intelligence.** Gonzales, A.J.; Osborne, R.L.; Kemper, C.T.; Lowenfeld, S. (Westinghouse Electric Corp., Orlando, FL). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

An Artificial Intelligence (AI) based, on-line Turbine Generator diagnostic expert system which is presently under development is described. Utilizing the inputs from a number of sensors, the diagnostic system evaluates the condition of the equipment and communicates appropriate action. This is an improvement over present monitoring systems which simply apply alarm limits to the value of each sensed variable. In comparison, a diagnostic system identifies equipment and instrument problems earlier with a higher degree of accuracy. 7 references, 2 figures.

15697 (EPRI-CS—4748, pp 3.69-3.78) **Mechanitrack system.** Cleveland, W.E.; Bowman, D.W. (Precision Mechanical Analysis, Inc., Brandon, FL). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

There are four primary ways one can approach the problem or maintaining rotating equipment: (1) operate it until it fails, then repair it at that time; (2) perform periodic inspections and lubrication changes to help avert on-line failures; (3) monitor machinery overall vibration levels and perform investigative maintenance; and (4) perform minimum maintenance and lubrication changes, but precisely when needed through advanced detection and scheduling. The fourth alternative, usually referred to an predictive maintenance would seem to be the only logical choice of every maintenance and operations supervisor. The state of the arts analytical equipment, computer programming, and consulting expertise have been coupled in order to establish the most modern and complete predictive maintenance program possible. In order to establish and implement a complete predictive maintenance program it must utilize four synergistic aspects: (1) real time vibration spectrum analysis; (2) lubrication degradation analysis; (direct reading emission spectrometry); (3) bearing temperature analysis; and (4) inspection schedule aspect. All four aspects need to be computerized for ease of data manipulation and review. The most critical areas incorporated in the mechanitrack program are reviewed.

15698 (EPRI-CS—4748, pp 3.79-3.99) **Acoustic emission monitoring of steam turbines: a review of progress.** Graham, L.J.; Randall, R.L.; Armor, A.F.; Scheibel, J.R. (Rockwell International Science Center, Thousand Oaks, CA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Experience over several years with on-line monitoring of steam turbines, supported by relevant laboratory studies, has led to a clearer understanding of the conditions under which acoustic emission (AE) due to turbine shaft cracking can be detected. For optimum detection of AE due to crack growth, the transducers should be placed as close to the location of the cracking and as far from extraneous noise sources as possible. For turbine shafts, this location is inside the rotor bore hole. However, problems in maintaining long-term stability of the transducers in this high temperature environment and with reliability in getting power and the electrical signals to and from the transducers would require a considerable development effort. Instead, in this program, the AE monitoring transducers have been located on the outside of the turbine shaft near its ends. To overcome problems associated with this noisier environment, efforts have been directed at improving the AE signal discrimination capabilities of the monitoring electronics. These efforts have been guided by extensive measurements of the amplitude, frequency and time dependence of normal turbine noises in a variety of operating conditions. Similar measurements have

been made in the laboratory to determine the characteristics of AE due to crack growth in rotor steels with several loading conditions and temperatures. These measurements, along with determinations of the attenuation and wave propagation characteristics of simulated AE in the rotor shafts, have permitted estimates of the detectability of AE due to crack growth under various conditions, should it occur. All of the development efforts have now been completed for initiating long-term monitoring to detect crack growth.

15699 (EPRI-CS—4748, pp 4.23-4.53) **Acoustic leak detection in fossil fueled boilers.** Snow, D.J.; Ball, P.A. (CEGB, Nottingham, England). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Acoustic leak detection systems were first installed in the CEGB power stations over a decade ago as experimental early warning devices. In the ensuing years the instrument has developed into a prove commercially available device fitted to 67 fossil-fuelled boilers in the UK. Eight boiler systems are operational in Scotland and initial installations are being commissioned elsewhere in Europe and other continents. This paper describes the development of the instrument into its present form, its positioning in the boiler and its method of operation. The key features and latest developments used to achieve extended reliability throughout the boiler are given. The paper goes on to describe the ability of the equipment to detect boiler leaks at an early stage using as examples the records of leaks occurring in different parts of the boiler. Also mentioned are associated benefits not originally envisaged such as early warning of sootblower malfunction and mechanical failure. Finally, the most recent developments including the choice of information display and the prospects for more refined leak location are discussed. 8 references, 17 figures, 2 tables.

15700 (EPRI-CS—4748, pp 4.55-4.78) **Leak detection by acoustic emission monitoring in power plant high pressure preheaters.** Famiglietti, M.; Scandolo, D.; Tonolini, F.; Ghia, S.; Regis, V. (CISE Spa, Milan, Italy). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The paper presents an acoustic monitoring technique for leak detection in feedwater HP preheaters. The leak detection is based on the ultrasonic noise produced by the turbulent leak outflow and transmitted by the metal of the component. The sensors are piezoelectric acoustic emission transducers, installed on the outer side of the shell of preheaters. The sensitivity of the instrumental system is satisfactory. The main results obtained in about three years of experimental activity both in laboratory and in power plants showed excellent reliability and performances of the AE leak detection monitoring system. The equipment is now under qualification tests in power station. 19 references, 12 figures, 1 table.

15701 (EPRI-CS—4748, pp 4.79-4.107) **Critical review of acoustic and acoustic emission leak detection in boilers.** Stulen, F.B. (Battelle Columbus Labs., Columbus, OH). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

A leak in any system is in some way detrimental to its operation. In nuclear power plants, a single leak of a sufficient size can force the entire plant to shut down. A leak in a recovery boiler, which is used extensively in the paper industry, can lead to a smelt-water explosion which damages the boiler and jeopardizes the safety of the operators. While a leak in a fossil-fired power plant does not cause such disastrous results, significant expenses can be incurred with leaks. Tube leaks in power plant boilers are frequent failures and are responsible for more forced outages in power plants than any other single cause. The cost to the utility industry is in excess of $500 million a year for replacement power charges and maintenance cost. Leaks may be controllable to some degree, but they are unavoidable and will continue to occur. Although leaks cannot be prevented, early detection of leaks can allow operators to schedule repair work to lessen the impact on production costs and down time. For this reason, efforts have been directed to develop leak detection systems for boilers. Two approaches which have been receiving much attention and evaluation are acoustic and acoustic emission (AE) methods. Both approaches monitor continuous random vibrations produced by the leak. In the acoustic system, the gas-borne sound, which is produced primarily by the eddies in the steam jet issuing from the leak is monitored. Acoustic emission monitoring involves detecting the structure-borne mechanical vibration also produced by the presence of the leak. The basis of each detection approach is discussed and some recent studies involving AE leak detection systems are reviewed. 19 references, 8 figures, 4 tables.

15702 (EPRI-CS—4748, pp 4.109-4.126) **On-line boiler stress and condition analyzer.** Davidson, M.J.; Jones, T.J. Jr.; Siddall, W.F.; Rosard, D.D.; Scheibel, J.R. (Combustion Engineering, Inc., Windsor, CT). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Combustion Engineering is under contract to EPRI to develop, construct and implement into a utility boiler a prototype on-line Boiler Stress and Condition Analyzer. The objective of the program is to develop and to demonstrate the analyzer's potential to optimize the life of critical boiler components. The analyzer has been designed to assist the operator to warn of damaging transients, to optimize boiler start-up/shutdown rates and to accumulate unit operation data to calculate component life expenditure. The analyzer has been installed at the Consolidated Edison Ravenswood #30 unit, a 1000 MW oil fired unit. This paper will outline the overall program and highlight significant results to date. 4 figures, 1 table.

15703 (EPRI-CS—4748, pp 4.127-4.133) **Initial feasibility study of halogen tracer method for finding boiler tube leaks.** Pelletier, C.A. (Science Applications, Inc., Rockville, MD). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

A feasibility study involving the detection of boiler tube leaks when they are very small is described. The study will assess the feasibility of fossil fueled power plants detecting small leaks in boiler tubes by releasing a gaseous tracer into the feedwater and analyzing the flue gas for the tracer. The plans and expectations for the program. 2 references, 2 figures are discussed.

15704 (EPRI-CS—4748, pp 5.35-5.59) **New approach for diagnostic monitoring of wear, erosion and corrosion in utility applications.** Sioshansi, P.; Blatchley, C.C.; Scheibel, J.R.; Duncan, D.; Fishburn, J. (Spire Corp., Bedford, MA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Surface layer activation (SLA) is an extremely precise and reliable method for in situ monitoring of material loss due to wear, erosion or corrosion. Progress is reported on two projects which were designed by EPRI and Spire Corporation to investigate the feasibility of applying the SLA technique in utility power generating plants. In one program a Spire/General Electric team is applying the SLA method to monitor the solid particle erosion of a stop valve bypass valve. In the other program a Spire/Combustion Engineering team is evaluating the SLA method as it applies to the study of bearing wear in boiler circulation pumps. While these two projects are aimed at preventing component failure or avoiding unnecessary preventive maintenance, the technique can also be applied as a diagnostic tool combined with a station performance monitoring system. Examples of possible diagnostic applications include: (1) correlating wear in first stage nozzles and buckets with efficiency loss, (2) evaluating methods for reducing solid particle erosion such as boiler chromating or resistant coatings on parts, (3) developing and evaluating new materials and designs to reduce erosion rates, and (4) evaluating and optimizing operating procedures. 13 references, 7 figures, 5 tables.

15705 (EPRI-CS—4748, pp 5.61-5.99) **Laser doppler measurement of torsional vibrations.** Mannava, S.R.; Scheibel, J.R.; Armor, A.F. (General Electric Co., Schenectady, NY). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

A non-contacting laser Doppler instrument is being developed at the General Electric Company under the sponsorship of Electric Power Research Institute (EPRI) to measure vibrations from a wide variety of power plant equipment with a minimal effect on normal plant operations. Ultimately, it should also be useful for applications requiring both short- and long-term diagnostic monitoring. A summary of results from laboratory experiments and subsequent factory testing is presented in this report. Discussed is the program carried out to demonstrate the feasibility of applying the laser Doppler technique to measure the torsional vibrations of rotating shafts. Several laboratory experiments were conducted to evaluate the performance characteristics under simulated operating conditions. This phase of feasibility was followed by a factory test on a production generator in the balance bunker facility of the General Electric Company, Schenectady, New York, to further verify the performance of laser Doppler concept. With the successful completion of the factory test, a significant milestone has been reached in the demonstration of the laser doppler technique to measure torsional vibrations in rotating shafts. Based on this development, a commercial device can be designed and packaged to measure torsional vibrations in a power plant environment. Briefly mentioned will be the current phase of the program to extend the laser Doppler technique to the measurement of linear vibrations. 20 references, 16 figures.

15706 (EPRI-CS—4748, pp 5.101-5.127) **Eddy current on-line monitoring for crack detection.** Chari, M.V.K.; Bedrosian, G.; Fealey, J.; Sober, T.J.; Scheibel, J. (General Electric Co., Schenectady, NY). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper summarizes the salient features of the work done to date on the EPRI funded project under RP1894-1 for exploring the feasibility of eddy current on-line monitoring techniques and their application to the detection and characterization of surface driven cracks in rotating machinery components. 6 references, 18 figures.

15707 (EPRI-CS—4748, pp 5.129-5.161) **Radiometric detection of cracks on stationary and moving surfaces.** Kaufman, I.; Choudhury, A.K.; Rankin, R.L.; Shyong, D.Y. (Arizona State Univ., Tempe). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The nondestructive testing methods of surface and subsurface regions to a depth of 0.050 inches (0.125 cm) in use at this time are visual inspection, liquid penetrant, magnetic particle, and eddy current (1). In this paper they describe the basis and initial results of work sponsored by the Electric Power Research Institute of Palo Alto, California, on investigation of another technique that will detect surface and subsurface imperfections. This technique, which is physically non-contacting, depends on the discovery of flaws such as surface cracks by monitoring of the thermal radiation emitted from the surfaces. Two difference methods of revealing a crack have been under investigation. In the first of these the surface is heated selectively and surface irregularities are revealed because they affect the heat transfer characteristics. In the second, which requires no heating, cracks are found because the emissivity of the region of a crack differs from that of the rest of the surface. They will concentrate first on the method requiring surface heating, which is applicable to finding both cracks and subsurface imperfections. This is followed by the second method, which is expected to be applicable to finding surface cracks as they might develop on a rapidly rotating shaft, while the shaft is in rotation. 17 references, 15 figures.

15708 (EPRI-CS—4748, pp 5.163-5.183) **Update on an acoustic doppler technique for detecting resonant turbine blades.** Leon, R. (Liberty Technology Center, Inc., Conshohocken, PA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The Franklin Research Center, and Liberty Technology Center, under EPRI project RP 1854, have been carrying out a test program to verify an acoustic Doppler technique which can be used for locating resonant turbine blades in operation. In this technique, a single sensor located in the casing slightly downstream of the monitored blade row is used to sense the acoustic energy radiating from the vibrating blade. Signal processing procedures, including synchronous averaging, selective blanking and envelope detection are used to uncover this small but highly characteristic waveform from the much larger background noise in the turbine. In the already completed Phase 1 portion of the program, the sensor to be used was selected, the expected Doppler effect was demonstrated, the synchronous averaging procedure was shown to be effective in removing the random flow noise, and using computer simulations a Hilbert transform approach was shown to be far more accurate for localizing multi-blade low-order vibrations than the original envelope detection method. The Phase 2 portion of the program is presently underway on a scaled down L-1 stage of a Westinghouse research turbine. Results to date have shown the selected sensors to be effective and exceptionally reliable. However, blade dimensional variations have resulted in an order-related flow wake pattern that presents unexpected demands on the technique. Two means of dealing with this new problem are being tested. One involves the use of two closely positioned sensors, and the other involves taking advantage of ultra slight speed changes of the turbine. On the plus side, this sensitivity to small dimensional variations might be used to detect such things as shroud section lifting, and this is being explored within the program as well. 10 figures.

15709 (EPRI-CS—4950, pp 1.1-1.8) **Cost of corrosion and scale in US utilities.** Jonas, O. Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Scale and deposits in turbines of electric utility plants cause a loss of efficiency whose cost is estimated in this paper. The major causes are listed for forced full and partial outages for the period 1971-80 for fossil fuel and nuclear power plants. The estimated cost of replacement and outage length are given for failures in major pieces of equipment in power plants. 6 references, 3 figures, 4 tables.

15710 (EPRI-CS—4950, pp 2.1-2.19) **Babcock & Wilcox Company water chemistry guidelines for once-through steam generators and drum boilers.** Pocock, F.J. (Babcock & Wilcox Co., Alliance, OH). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Test facilities and research programs are reviewed which were carried out by Babcock and Wilson Company on water quality requirements for once-through steam generators and drum boilers. Guidelines are given for water quality for drum-type boilers operating at 2000 psig or higher for base-loaded power operation and for cycling service. Further research needed for improving water quality control for cycling operations is listed. 42 references, 12 figures, 4 tables.

15711 (EPRI-CS—4950, pp 3.1-3.18) **Recommended water chemistry practices for high pressure-drum type boilers.** Goodstine, S.L. (Combustion Engineering Inc., Windsor, CT). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Electric utilities in the United States are placing increasing emphasis on extending the life of their fossil fueled boilers. Many are undertaking Life Extension Studies to determine the necessary maintenance needed to continue operation of older units another 10 or more years. Examination of tube samples taken from units as part of these Life Extension Studies and samples submitted for failure analysis show that internal corrosion and deposition continue to be problem areas. This paper reviews the water chemistry practices recommended by Combustion Engineering for high pressure drum-type utility boilers. Requirements for water chemistry control are based on the need to mitigate the effects of: oxygen corrosion, deposition, and contaminant inleakage. All phases of operation, including standby, startup, and operation are discussed. Additional recommendations for units in cycling duty are also covered. 5 references, 4 figures, 6 tables.

15712 (EPRI-CS—4950, pp 4.1-4.22) **Factors affecting boiler water chemistry.** Amoruso, G.V. (Foster Wheeler Development Corp., Livingston, NJ). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The control of boiler water purity in power plants is of vital concern to power plant operators because of its crucial impact upon power plant operation, efficiency, and structural integrity of critical components. This paper deals with a contractor's rationale for boiler feedwater purity, some factors affecting boiler water chemistry, and the ramifications of boiler water impurities on structural steel components in power plants. 5 references, 11 figures, 2 tables.

15713 (EPRI-CS—4950, pp 5.1-5.15) **Steam turbine chemistry - a review.** Gould, G.C. (General Electric, Schenectady, NY). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The turbine acts as a fractional distillation tower concentrating impurities in steam to levels where, as aqueous solutions, they can cause serious problems of fouling or corrosion. The thermodynamic properties of the steam water and impurities are such that the concentrating mechanisms will proceed and deposition problems will occur if the vapor phase concentration of impurities exceed I ppb. Recent experiments show that some relief from the dire predictions of thermodynamics is gained at low concentrations of impurities by the fact that the rate of condensation is apparently too slow at very dilute steam solutions to condensate the concentrated solutions. Concentration of impurities was observed when the level of impurities was in the 5-10 ppb range. Due to the wide variety of potential deposits, and the fact that turbine materials need to have many properties in addition to corrosion resistance, it seems unlikely that a corrosion resistant turbine is realistic solution to the problem of turbine deposits. The primary control of turbine deposits and the concomitant problems of fouling, corrosion and corrosion fatigue still lies in the careful control of impurity levels in the steam. This in turn requires careful control of the water conditioning and treatment procedures. 27 references, 4 figures.

15714 (EPRI-CS—4950, pp 6.1-6.15) **Steam purity recommendations - the Westinghouse experience.** Bellows, J.C. (Westinghouse Electric Corp., Orlando, FL). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The Westinghouse Steam Purity Recommendations are presented and the rationale for their formulation is discussed. Tentative revisions are given. An extensive monitoring program has shown the recommendations to be measurable and achievable. The chemical control strategy of never exceeding normal operation limits has led to the development of a chemical artificial intelligence diagnostic system to aid in determining the cause of power plant chemistry upsets. Comments on the opportunities and pitfalls of a system approach to chemistry guidelines are made. 11 references, 5 figures, 1 table.

15715 (EPRI-CS—4950, pp 7.1-7.20) **Impact of feedwater chemistry on feedwater heater tubes.** Impagliazzo, A.M.; Bell, R.J.; Conley, E.F. (Heat Transfer Consultants, Hingham, MA). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Although corrosion is well defined as a generic feedwater heater problem, no single document has been published which provides sufficient information to enable utility engineers to understand the complex materials/environmental interplay that is involved in feedwater heater corrosion. Perhaps what has been the most elusive of all necessary information is a practical guideline which provides definition of feedwater heater susceptibility to corrosion by material, actual environment, and component location within a specific feedwater heater design. Actual environment alludes to the fact that, although, the bulk feedwater composition is high purity, from a corrosion perspective the composition of the feedwater which is immediately adjacent to the locally corroding metal surface is the only water chemistry of significant concern. In other words, feedwater contaminant concentrating factors must be addressed. Some of these factors are feedwater evaporation and contaminant recrystallization on another surface, deposition of entrained contaminants through flashing or contaminant concentration through electrostatic attraction at locally corroding sites. Similarly, the sources of such contaminants must be identified. This paper concentrates on the effect of the feedwater heater environment upon various tube materials. Copper alloys, Monel-400, carbon steel, 304 stainless, and ferritic stainless steels are the materials of interest in this study. 4 references.

15716 (EPRI-CS—4950, pp 8.1-8.13) **Deaerators - design and operation, effect on water chemistry, corrosion problems.** Jonas, O. (Jonas, Inc., Wilmington, DE). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Deaerators (direct contact deaerating heaters) are used in fossil and some nuclear power plants to remove dissolved gases (mostly oxygen and nitrogen) by mechanical deaeration and to provide water storage capacity to give a residence time at appropriate elevated temperatures for chemical oxygen scavenging to take place. In addition, deaerator storage capacity and hydrostatic head provide flow conditions for the boiler feed pump. A typical location of a deaerator in a drum boiler and once-through fossil cycle is between the low pressure and high pressure feedwater heaters before the boiler feed pump. Most deaerator vessels are fabricated from carbon steel. This paper discusses deaeration and oxygen scavenging mechanisms, corrosion problems and protection, research programs, and emerging options which may replace the oxygen removal function of deaerators. 12 references, 11 figures.

15717 (EPRI-CS—4950, pp 9.1-9.32) **Condenser performance improvements.** Colt, R.L. Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Laboratory testing and field experience provide persuasive evidence that a high percentage of failures in boilers/steam generators and low-pressure steam turbines are corrosion induced, and that leakage of air and cooling water into the condenser plays a critical role in the mechanisms of these failures. If one concurs with this assessment, the actions that should be taken to minimize the problem include at least the following: (1) ensure essentially zero inleakage of cooling water over the expected life of the plant by selecting corrosion-resistant materials and providing adequate maintenance; (2) minimize air inleakage; (3) provide for improved condenser deaeration at low loads. 21 references, 34 figures.

15718 (EPRI-CS—4950, pp 10.1-10.47) **Transport of chemicals in steam cycles.** Jonas, O. (Jonas, Inc., Wilmington, DE). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Transport of impurities and water treatment chemicals in steam cycles is described. Chemical species found in water, steam, and deposits are identified, their major sources and removal processes discussed, and effects of cycle design, material selection, steady and transient operation, and water chemistry described. Typical data are given to illustrate that the knowledge of chemical transport is important for the control of scale and corrosion. Such control is successful when the relationships between the measured average bulk concentrations in cycle streams and the localized concentration and corrosion processes on surfaces of cycle components are understood. 64 references, 21 figures, 9 tables.

15719 (EPRI-CS—4950, pp 11.1-11.8) **EEI chemistry committee perspective - current US utility practices.** Blood, F.X. (Union Electric, St. Louis, MO). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The organization, membership, and technical scope of the EEI Chemistry Committee are described. The technical scope includes all corporate chemistry-related functions, with emphasis directed toward the engineering, operation, and maintenance of fossil and nuclear power plants and electrical apparatus. A listing is given of the subjects of reports which relate to aspects of water chemistry submitted at the meetings held during the last two years. The combined knowledge and experience of EEI Chemistry Committee members is a great resource to call upon in the resolution of problems.

15720 (EPRI-CS—4950, pp 12.1-12.22) **Overview of RP2712-1, interim consensus guidelines on fossil plant cycle chemistry.** Aschoff, A.F.; Sopocy, D.M.; Dooley, R.B.; Coit, R.L. (Sargent & Lundy, Chicago, IL). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

In an effort to establish some degree of standardization in the fossil industry comparable to that now available in the nuclear industry, EPRI has originated a research program, RP2712, to address the various problems related to water chemistry, forced outages, and corrosion and deposit control. The first three phases of RP2712 consist of: RP2712-1, Generation of Interim Consensus Guidelines on Fossil Plant Cycle Chemistry; RP2712-2, Instrumentation and Control for Fossil Plant Cycle Chemistry; and RP2712-3, Monitoring Cycle Water Chemistry in Fossil-Fired Plant. RP2712-1 was recently awarded to Sargent & Lundy and work was begun on April 25, 1985. This paper is devoted to a discussion of the scope of work and progress of RP2712-1.

15721 (EPRI-CS—4950, pp 13.1-13.17) **TUGCO's turbine environment index.** Wadlington, M. (Texas Utilities Generating Co., Dallas, TX). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

In the spring of 1979 TUGCO began experiencing corrosion assisted failures of low pressure turbine blades at two of the lignite-fired plants, Big Brown and Monticello. Eventually similar failures occurred at the Martin Lake Station. Deposition, pitting, and cracking characterized all of our blade failures. The deposits were predominantly silica and iron oxide but smaller amounts of sodium and occasionally chloride were found. A major effort and emphasis was placed on improving the low pressure turbine environment. Corrective actions included: tighter water/steam quality parameters; improved condensate log sheet; implemented condensate log sheet; implemented start-up log sheet; added state of the art sodium and chloride analyzers; conducted steam purity seminars; utilized portable water quality monitors for sampling low pressure steam, heater drains, individual polishing demineralizer vessels, etc.; added ion chromatography instrumentation and routine grab-sample analyses; TOC analyses; U-bend corrosion specimens in the L.P. Turbine; condensate polisher performance testing; hydrazine injection into the lower pressure turbine inlet (crossover) on 7 units; and turbine environment index. The Turbine Environment Index (TEI) is defined as the air leakage (in SCFM) time 0.10 plus the cation conductivity times 10 plus values for the dissolved O_2, Na, and Cl (in ppb).

15722 (EPRI-CS—4950, pp 14.1-14.15) **SCE experience.** Henderson, K.B. (Southern California Edison, Paramount CA). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

This paper discusses the operation of the chemical group associated with the Steam Generation Division of Southern California Edison (SCE). Philosophy of operation, current organization and duties, and one major study improvement effort (factors limiting condensate polisher performance) are discussed. The impact of the group's work on the condition of the equipment is also reviewed. The work in the area of steam purity as discussed in this paper can be reviewed in more depth by referring to EPRI Report CS-4005, Project 1408-3, May 1985. 1 table.

15723 (EPRI-CS—4950, pp 15.1-15.9) **Evaluation and use of iron dispersants in the Con Edison System.** Connick, B.J. (Consolidated Edison Co. of New York, Inc., Astorian). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Con Edison began using iron dispersants in an attempt to reduce hydrogen embrittlement type failures. By keeping the preboiler corrosion products from accumulating on the boilers high heat input zones, hydrogen embrittlement failures would be reduced. The iron dispersants were used at the 1600 psig boilers at the East River and Waterside stations beginning in 1976. During the period from 1976-1980 tube failures were dramatically reduced and service hours between tube leaks increased from 800 hours to 27,000 hours. As a result of this success, the utility wanted to expand the use of these dispersants to include the higher pressure units. However, a better understanding of the measurement and dynamics of dispersants was still needed. The research program jointly developed by Con Edison, EPRI, and ESEERCO, the test loop design, and preliminary results from the program are described.

15724 (EPRI-CS—4950, pp 16.1-16.5) **EPRI fossil plant cycle chemistry programs.** Dooley, B. (Electric Power Research Institute, Palo Alto, CA). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

In 1984 EPRI formulated a series of projects (RP2712) to address the overall problem of cycle chemistry in fossil plants. The overall project is outlined in three parts: (1) RP2712-1 Interim Consensus Guidelines; (2) RP2712-2 Instrumentation and Control for Fossil Plant Cycle Chemistry; and (3) RP2712-3 Monitoring Cycle Chemistry in Fossil Fired Plant. Three ether related projects are also briefly described: (1) RP1184-9 Corrosion Product Transport in Cycling Fossil Plants; (2) RP1890-1 Boiler Tube Failure Manual; and (3) RP1608-1 Chemical Cleaning Manual.

15725 (EPRI-CS—4950, pp 17.1-17.16) **Cycle chemistry: sampling points and frequencies, presentation, and use of analytical data.** Axley, R.G. (Tennessee Valley Authority, Chattanooga). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

TVA currently has 11 fossil stations in service. These include 47 drum units on a coordinated phosphate boiler water treatment scheme, 5 drum units on an all-volatile boiler water treatment (AVT) program, and 7 once-through units also on AVT. The AVT drum units are higher pressure units (2400 pounds) while the phosphate-treated drum units are lower pressure (1400 to 2000 pounds). In addition, TVA has one fossil station, consisting of 4 low-pressure (850 pounds) phosphate-treated drum units, in a mothball storage status. The type and frequency of cycle monitoring is distinctly different for each of the three types of units described above. Tables are attached describing sampling locations in the cycle, the parameters monitored at each location, the limits specified for each parameter, and the minimum recommended frequencies of analyses of each type of unit. This information, along with analytical procedures, sampling procedures, chemical cleaning procedures, and discussions on various aspects of boiler water treatment, are included in TVA's Division of Fossil and Hydro Power Water Treatment Manual. The plant summaries are of little immediate use to central office personnel because of the time lag in receiving the data. However, they are of importance in evaluating long-term problems such as turbine deposits or unusually heavy amounts of metals removed during boiler chemical cleanings. Undoubtedly, a data base of steam cycle water chemistry with associated software analyses of this data would be of great benefit. However, this is a long-term future project for the central office staff. Initial inroads in this area have been made with NPDES permit analytical data and boiler cleaning data. 5 tables.

15726 (EPRI-CS—4950, pp 18.1-18.23) **Chemical analysis for fossil plant water chemistry.** Allmon, W.E. (Babcock & Wilcox, Alliance, OH). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

High quality analytical chemistry methods are required for both routine plant monitoring and research programs for fossil-fuel power generating plants. Inaccurate results can lead to improper decisions, which may result in expensive repairs and lost operating time. This paper discusses sampling equipment, sampling location and frequency, analytical methodology, and the collection and interpretation of analytical data. Differences between continuous and periodic analyses are also examined. 33 references, 4 figures, 6 tables.

15727 (EPRI-CS—4950, pp 19.1-19.15) **Fossil plant water chemistry - C.E.G.B. approach and experience.** Bates, A.J. (CEGB, Bristol, England). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The CEGB supplies electricity in England and Wales, where there is a tendency to build power plants on coastal sites. Any condenser leakage, therefore, will involve chlorides so that water chemistry control involves the prevention of chloride-type corrosion. This paper describes approved guidelines, known as Generation Operation Memoranda, for the chemical control of steam/water circuits of power stations in the United Kingdom. Also discussed are on-load corrosion, choice of alkali, current CEGB practice for control of acid chloride corrosion, and an alternative acid chloride corrosion control concept.

15728 (EPRI-CS—4950, pp 20.1-20.18) **Adoption of water chemistry principles in fossil power plant design and operation.** Bursik, A. (Grosskraftwerk Mannheim Ag, West Germany). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The interrelationships of water chemistry, operation, design, and materials are discussed for fossil fuel power plants in the FRG. Specifically this paper discusses the quality of water for the water/steam cycle, material selection, pre-operational chemical cleaning, water/steam cycle conditioning, condensate polishing, boiler water conditioning, operational chemical cleaning, change of operating mode, layup preservation, and corrosion fatique of turbine blades. 13 references, 17 figures.

15729 (EPRI-CS—4950, pp 21.1-21.17) **Fossil plant water chemistry in Japan.** Mizuno, T. (Central Research Institute of Electric Power Industry, Tokyo, Japan). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

A review is presented which briefly describes the share of fossil fuel power plants in the electric power industry of Japan; water quality specifications; boiler water treatment method; practical water chemistry; management of water chemistry; chemical cleaning; and new techniques. Tables present data on most of these aspects. 5 figures, 12 tables.

15730 (EPRI-CS—4950, pp 22.1-22.22) **Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service.** Sturla, P. (ENEL, Piacenza, Italy). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

At the beginning of the 70's, ENEL had to face a problem which is typical of some once-through subcritical units. Rather fast deposition phenomena on partial flow control valves made frequent acid cleaning of the generator necessary, which penalized the service and the units availability. The solution was found in the correct utilization of hot operating pulverized resin filters and in the improvement of water-steam cycle conditioning. But on that occasion the investigation carried out by ENEL Central Laboratory was much more extensive than needed for an immediate solution of the problem; as a matter of fact it developed according to these guidelines: definition of deposition phenomena in its quantitative and qualitative terms; characterization of environment from a physico-chemical point of view; and study of nature of ionic and non-ionic species present in feed water for a correct parameterization of the physico-chemical environment. This paper describes the additional work by ENEL-DCO Central Laboratory, Piacenza, in an attempt to verify the validity of the hypotheses made at that time and extend them to the physico-chemical situation of the whole steam-water cycle. Iron oxides in the steam-water cycle are discussed, and analysis is presented of normal service conditions. 43 references, 3 figures, 2 tables.

15731 (EPRI-CS—4950, pp 23.1-23.17) **Operation and design requirements of cyclic steam turbines.** Silvestri, G.J. Jr. (Westinghouse Electric Corp., Orlando, FL). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

While Westinghouse steam purity recommendations are the same for base loaded and cycling steam turbines, operation outside of the recommended limits is more likely to occur with cycling units unless corrective measures are implemented. Although steam contaminants can result in component failure and plant outages, in some instance the consequences have been more benign. In the 1950s and 1960s, for example, there were problems with silica and copper deposits which resulted in increased operating costs because of efficiency and/or capacity degradation, but did not degrade turbine reliability. Oxygen content can increase markedly with cyclic operation because of (1) vacuum breaking during shutdown, (2) degradation of condenser deaerating performance below 50% load, (3) loss of the protection afforded by the deaerator and (4) high makeup requirements during startup. Excessive oxygen, either singly or in combination with other impurities, can accelerate pitting, lower fatigue strength and accelerate stress corrosion cracking. Phosphate and pH excursions have been experienced during shutdown and startup of cycling units. Control of these two variables is affected by the necessity for trickle feedwater on some boilers and the need to dump water to overcome boiler swell during startup. 19 references, 7 figures, 1 table.

15732 (EPRI-CS—4950, pp 24.1-24.8) **Experience with water chemistry control in cycling units at Detroit Edison.** Gilbert, W.D. (Detroit Edison Co., MI). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

For many reasons, cycling service is the most difficult service a unit may see. This type of service coming at what would normally be considered near the end of life for a unit, coupled with a new look at extending the life of units, presents a very real challenge for the plant chemistry staff. Some of the ways Detroit Edison, and others, are meeting this challenge are described. The areas discussed include: oxygen control on start-up; silica control on start-up; condensate polishing demineralizers; chemical cleaning frequency; continuous blowdown - continuous treatment; boiler layup; and chemistry surveillance.

15733 (EPRI-CS—4950, pp 25.1-25.28) **Water and steam chemistry control experiences with fossil peaking units.** Hagewood, B.T. (Long Island Lighting Co., NY). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

Load management at the Long Island Lighting Company, New York, involves the use of four steam-electric peaking units. Oxygen corrosion control using the following methods is discussed: steam pressure on the steam drum; vacuum on the condenser; dry storage; nitrogen blanketing water and steam contacted surfaces; catalyzed hydrazine; corrosion resistant alloys in the preboiler system. Boiler water silica control and boiler water pH-phosphate limits are also discussed. Recommendations are given. 10 references, 6 figures, 5 tables.

15734 (EPRI-CS—4950, pp 26.1-26.18) **Phosphate and other hide-out.** Stodola, J. (Ontario Hydro, Toronto). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The majority of fossil fuel fired drum utility boilers in USA as well as a large number of units in Canada and Europe are operating on some form of phosphate boiler water treatment. The phosphate regime is superior for the protection of carbon steel boiler tubes on units experiencing frequent condenser tube leaks and having no or limited condensate polishing facilities. In addition there is statistical evidence showing a lower incidence of stress corrosion cracking damage in turbines coupled with boilers on phosphate chemical control. The in-service hide-out of phosphate and corresponding problems of boiler water alkalinity control has led some operators to switch to other boiler water treatments, namely low level caustic and all volatile treatment (AVT). The switch to AVT was not always without problems and, in fact, phosphate continues to be injected on many units regularly on AVT when a condenser tube leak is detected. The phosphate treatment would be even more popular if the uncertainty connected with hide-out phenomenon was alleviated. This paper describes the characteristics of chemical hide-out phenomenon, the conditions leading to hide-out, and solubilities of dissolved solids. The experimental data from two recent studies on chemical hide-out are presented and discussed. 17 references, 8 figures, 1 table.

15735 (EPRI-CS—4950, pp 27.1-27.16) **Corrosion product transport in a cycling fossil plant.** Hook, T.A.; Sawochka, S.G.; Pearl, W.L.; Scheibel, J.; Pugsley, J. (NWT Corp., San Jose, CA). Dec 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920148. (CONF-8506329—).

From Fossil plant water chemistry symposium; Atlanta, GA, USA (11 Jun 1985).

The objectives of this program are to determine the effect of major chemistry parameters (pH, hydrazine and oxygen) and operating procedures on corrosion and corrosion product transport in cyclic high pressure fossil boilers and to recommend methods that will reduce corrosion product transport thus leading to increased availability of these units. This report presents results from the first of a series of tests conducted at the Port Everglades Station of Florida Power and Light to quantify the effect of chemistry and operational changes on corrosion product transport during cyclic operation. Results are presented on condensate, feedwater, and boiler water chemistry. Corrosion product concentrations and mass transport are discussed. 8 figures.

15736 (EPRI-CS—5013) **Corrosion-resistant coatings for low-pressure steam turbines: Final report.** (Westinghouse Electric Corp., Orlando, FL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 261p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920233.

Inexpensive and readily available coatings - such as ion vapor-deposited aluminum and nickel cadmium electroplate - can control corrosion of components in low-pressure steam turbines. These coatings provide increased component life and unit availability without costly changes in turbine design or alterations in water chemistry.

15737 (PB—87-120531/XAB) **Materials for large land-based gas turbines. Final report, 1984-1986.** (National Materials Advisory Board (NRC), Washington, DC (USA)). 1986. 110p. (NMAB—430). NTIS, PC A06/MF A01.

Advanced large land-based gas turbines are expected to be a key component in the generation of electric power based on coal gasification and a combined-cycle gas turbine-steam turbine system. The development of gas turbines in the 120- to 150-MW range with turbine inlet temperatures of 2600°F at pressure ratios up to 16:1 is envisioned over the next 15 to 20 years. Currently available and developing materials technology useful for large machines is reviewed and discussed. Although the primary source of these developments is the aircraft engine field, other sources are also reviewed. Suitable technology appears to be available for the development of higher-power, long-life turbines for utility power generation. Recommendations are made for specific research and development efforts that address the special requirements and environment of these machines.

2002 Environmental Control Technology

REFER ALSO TO CITATION(S) 15311, 15312, 16357, 16704

15738 (EPRI-CS—4918-Vol.3, pp 1.1-1.13) **Distribution of fly ash in a filter bag operating with a charged axial electrode.** Lamb, G.E.R.; Duffy, K.T. (Textile Research Institute, Princeton, NJ). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Further progress in the development of techniques for electric stimulation of fabric filtration (ESFF) will require participation of baghouse users in testing the concept and providing valuable feedback from full-scale operation experience. Participation is more likely to be assured if the ESFF system is simple, relatively inexpensive, and easy to maintain. The original system developed at the Textile Research Institute consisted of a bag fitted with alternate live and ground wires spaced an inch apart. An approach to simpler systems has taken the form of a charged axial electrode (or anode) with all bag electrodes grounded. The work described here centers on further simplification and optimization of this arrangement by studying the effect of anode diameter and number of grounded wires in the bag, including a system which requires no bag wires. 13 references, 8 figures, 1 table.

15739 (EPRI-CS—4918-Vol.3, pp 2.1-2.15) **Study of electrostatically stimulated filtration fundamentals.** Vanosdell, D.W.; Viner, A.S.; Carter, K.D.; Hovis, L.S. (Research Triangle Institute, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Electrostatically augmented (EA) filtration has been shown to perform better than conventional filtration. The fundamental causes of the improved performance remain unclear, however, and were the objects of this research. Preliminary results of bench-scale experiments conducted with an EA filter and of a mathematical modeling study of EA filtration are presented below. The performance of the experimental filter was evaluated by recording overall filter pressure drop at the operating face velocity and measuring filter permeability, dust cake mass, and dust cake porosity as functions of position on the filter. From these measurements, the specific resistance of the dust cake was calculated as a function of position on the filter. The mathematical model of the flow field and particle trajectories was used to predict the dust deposition pattern. Also, the dust cake resistance was estimated as a function of position and averaged over the filter surface. The model showed that inertial forces were negligible under most conditions and that gravitational, fluid drag, and coulombic forces controlled the motion of the particles as they approached the filter surface. Coulombic forces dominated the particle trajectories under many conditions and, apparently, caused the visible particle accumulation near the electrodes. Though coulombic forces accounted for the gross distribution of dust on the filter, other forces appear to control the fine structure of the dust cake. Porosity and specific dust cake resistance were relatively constant over most of the filter surface. At high field strengths, a small increase in porosity (and consequent decrease in dust cake flow resistance) was observed near the electrodes. 7 references, 11 figures.

15740 (EPRI-CS—4918-Vol.3, pp 3.1-3.15) **Mathematical model for advanced electrically stimulated fabric filtration.** Yamamoto, T.; Ensor, D.S.; Mosley, R.B.; Hovis, L.S.; Plaks, N. (Research Triangle Institute, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Laboratory and pilot studies have demonstrated successfully that an advanced center-wire Electrically Stimulated Fabric Filter (ESFF) can be operated at a significantly lower pressure drop than a conventional reverse-air fabric filter. A comprehensive mathematical model has been developed to predict behavior and detailed deposition processes of the ESFF. The model incorporates flow modification that results from variations in particle distributions on the bag filter. Time-dependent gas streamlines, particle streamlines, and mass distributions are evaluated, and the corresponding areal mass density, pressure drop ratio (PDR), and modified specific resistance coefficient (K_s^*) are demonstrated for typical ESFF operating conditions. The results obtained from the model study illustrate a significant reduction in the pressure drop and provide an insight into the deposition process. Laboratory and pilot studies, performed for a range of operating parameters, support the model's conclusions. 3 references, 11 figures.

15741 (EPRI-CS—4918-Vol.3, pp 4.1-4.20) **Advanced ESFF laboratory test results.** Mosley, R.B.; Hovis, L.S.; Daniel, B.E. (Environmental Protection Agency, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Advanced electrical stimulation of fabric filtration (AESFF) consists of combining electrical precipitation with the usual process of electrically stimulated fabric filtration (ESFF). Through both laboratory and pilot studies EPA has demonstrated a significant improvement in performance when AESFF is applied. In particular, significant pressure drop reductions occur as a result of the reduced dust loading on the upper portions of the bags. This reduced pressure drop allows for the potential either to operate at a lower pressure drop or to operate at a higher gas flow rate. Areal mass density, cake thickness, and bulk mass density were measured for both resuspended spray dryer material and fly ash. Gas flow redistribution due to non-uniform dust cakes was observed to occur for pressure drops greater than 4 inches of water (996 Pa). Significant reductions in bulk mass density were observed due to deposition under the action of applied electric fields. 11 references, 12 figures.

15742 (EPRI-CS—4918-Vol.3, pp 6.1-6.20) **Advanced electrostatic fabric filtration experience at Southwestern Public Service Company.** Serrurier, R. Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

In October 1985, the advanced electrostatic fabric filtration (A-ESFF) configuration conversion of the pilot baghouse facility at Southwestern Public Service Company's Harrington Station was completed. Since initial start-up, evolutionary changes in both the operation and configuration have occurred. These changes are discussed herein. Results to date confirm the existence of a favorable A-ESFF effect. However, it has not been possible to sustain the effect in a steady-state manner. Reasons to explain this behavior have been proposed but remain to be confirmed by future experimental work. Experimental results to date are presented. 3 references, 12 figures.

15743 (EPRI-CS—4918-Vol.3, pp 7.1-7.16) **Economics of advanced electrostatic stimulation of fabric filtration.** Hovis, L.S.; Viner, A.S. (Environmental Protection Agency, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Advanced Electrostatic Stimulation of Fabric Filtration (Advanced ESFF), with its center-wire configuration which produces corona charging in particles to augment an external electrical field, has a performance edge over other electrostatic enhancement methods. Laboratory and pilot plant results show a consistently lower pressure drop and a rate of pressure drop rise that is 70% less than those of conventional filtration. A study of the economics of Advanced ESFF was undertaken to determine if the improved performance would more than compensate for the increased cost of electrical hardware and additional maintenance. The cost model that had been developed for conventional ESFF (parallel external field and no particle charging) was modified to account for the center-wire concept and used to compare Advanced ESFF capital and operating costs with those of conventional filters. The economic advantage of Advanced ESFF is based on its ability to operate at a higher air-to-cloth ratio while maintaining the same pressure drop as a conventional filter. The ability to operate with higher air-to-cloth ratios translates to capital cost savings due to smaller baghouse size. 11 references, 7 figures.

15744 (EPRI-CS—4918-Vol.3, pp 10.1-10.15) **Evaluation of a specific type of filter bag supplied by various vendors.** Chen, Y.; Roberts, P.N.; Tarnok, T.D. (Joy Manufacturing Co., Los Angeles, CA). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

A detailed test program was conducted for fabric filter bags procured under the same specification from various bag fabricators, weavers, and finishers of fabric material. The filter bags were inspected for the integrity of the fabric, quality of fabrication and then installed in the same compartment of the N.S.P. Riverside baghouse for field testing. This paper describes the test procedures and presents the results of bag fabrication inspection and field evaluation for this specific type of fabric filter bag. Based on the test results of this test program, specific procedures of bag procurement are recommended. 6 figures, 6 tables.

15745 (EPRI-CS—4918-Vol.3, pp 11.1-11.16) **Catenary analysis of a fabric filter bag during reverse-gas cleaning.** Samuel, E.A.; Musgrove, J.G. (General Electric Environmental Services, Inc., Lebanon, PA). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The catenary-like shapes and the corresponding tensions along a utility-size fabric filter bag during reverse-gas cleaning have been calculated by an iterative technique which ensures consistency between the bag tensions and deflections, including the effect of bag stretch under tension. The maximum bag deflections occurring midway in each bag segment between successive anti-collapse rings are first calculated. The axial gas velocities are then deduced from these deflections assuming a constant reverse gas-to-cloth ratio across the entire bag. Characteristics of a given ring spacing, including curves of calculated deflection and axial gas velocity vs. height are used to compare the effects of reverse-gas pressure drop, dust weight on bag, and springs of variable length and spring constant. This catenary model is useful for optimizing spring design for specialized baghouse operating conditions, such that critical bag parameters and the maximum axial gas velocity during reverse gas cleaning are within design limits. The analysis shows that the spring tension during reverse-gas cleaning is independent of spring constant provided the spring if fully compressed during the reverse flow. The spring tension during reverse-gas is shown to be much larger than its pre-tension value. Fully compressed operation of the bag spring during reverse-gas flow is shown to be advantageous for baghouse operation. A simple model for explaining the observed time-variation of the bag tension due to the fall of the plug-like dust released within the bags, is also presented. The predictions of this model may be used to factor into the catenary analysis of a bag suspension system, the effects of the time-varying spring tension during reverse-gas flow. 4 references, 11 figures.

15746 (EPRI-CS—4918-Vol.3, pp 12.1-12.19) **Aerosol deposition in fabric filters.** Ensor, D.S.; Yamamoto, T.; Viner, A.S. (Research Triangle Institute, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The deposition of particles on fabric filters will determine the pressure drop and collection efficiency of the filter cake and supporting fabric. The morphology of the deposit has been difficult to characterize because of its irregularity. Deposition mechanisms and the resulting theoretical structures have been analyzed using fractal geometry. Potential applications to filtration technology are discussed. 28 references, 8 figures, 3 tables.

15747 (EPRI-CS—4918-Vol.3, pp 13.1-13.17) **Performance of a high-sulfur-coal, pilot-scale fabric filter.** Heaphy, R.F.; Wilson, R.R.; Piulle, W.V. (Southern Research Institute, Birmingham, AL). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

To study the effects of flue gas from burning eastern, high-sulfur coal on the performance of fabric filters, the Electric Power Research Institute is evaluating the performance of a 10-MW pilot-scale baghouse. Operation over the past 40 months included cleaning by reverse-gas, reverse-gas with sonic assist and shake/deflate. Outlet emissions were below 0.004 lb/million Btu, and collection efficiencies were greater than 99.9%. The pressure drop across the bags was 5.5 in. H_2O or less for filtering times of three hours. For reverse-gas cleaning, residual dustcake weights were about 1.0 lb/ft^2 versus less than 0.5 lb/ft^2 for sonic-assisted and shake/deflate cleaning. Dustcake weight was also sensitive to startup and shutdown procedures, and it increased rapidly with more frequent shutdowns. High bag failure rates occurring during the shake/deflate operation may be attributable to excessive deflation flows or shaking accelerations. 1 reference, 7 figures, 1 table.

15748 (EPRI-CS—4918-Vol.3, pp 14.1-14.16) **Flue gas conditioning for improved baghouse performance.** Laudal, D.L.; Miller, S.J. (Univ. of North Dakota Energy Research Center, Grand Forks). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Baghouse performance has been shown to be dependent on both the chemical and physical properties of the ash. Small amounts of ammonia and sulfur trioxide were added to the flue gas as conditioning agents to modify ash characteristics and reduce fine particulate emissions from a pilot-scale coal combustion/baghouse system. Tests were made with three western low-rank coals which produce difficult-to-collect fly ash. Total particulate emissions over several cleaning cycles were substantially reduced and fine particulate emissions were reduced up to four orders of magnitude between the cycles. With conditioning baghouse pressure drop increased at a slower rate and reached a lower operating pressure drop after several cleaning cycles. Ash samples were analyzed to determine physical and chemical changes due to ammonia and sulfur trioxide addition. Several ammonia-sulfur compounds were found indicating a complex chemical mechanism. Changes in the fly ash particle size distribution and bulk ash cohesiveness may help explain the physical mechanism by which both pressure drop and particulate emissions are reduced. 14 references, 7 figures, 4 tables.

15749 (EPRI-CS—4918-Vol.3, pp 15.1-15.19) **Operation and maintenance experience at Harrington Station.** Hooks, W.; Plunk, O.; Harmon, D.L. (Southwestern Public Service Co., Amarillo, TX). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The damper, deflation air, shaker, and bag systems of the baghouse of this Texas utility are described. Operation and maintenance of the shake/deflate baghouse controlling flyash emissions in a 360 MW coal-fired plant are discussed. Cost data on the various systems are provided. Discussion of bag life is also presented. 3 figures, 6 tables.

15750 (EPRI-CS—4918-Vol.3, pp 16.1-16.10) **Computer monitoring of pilot plant baghouse performance.** Viner, A.S.; Fickel, L.M.; Hovis, L.S. (Research Triangle Institute, Research Triangle Park, NC). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

A computerized monitoring system was installed on a pilot plant baghouse to permit unattended operation of the unit. Sensors were installed to measure inlet and outlet gas temperatures, pressure drops across flow orifices, tubesheet pressure drops, and electrical conditions in an electrostatically augmented compartment. The signal lines from these sensors were connected to a programmable datalogger which also served as the interface to a microcomputer. Data were recorded on the data logger and stored on a fixed disk in the microcomputer. A modem coupled with computer software allowed researchers to call the microcomputer from long distance and collect data daily. Once retrieved, the data were quickly analyzed to evaluate performance and to identify any problems in operation. In addition, the datalogger could be reprogrammed through the phone link. The strip chart from the datalogger served as a backup of the data recorded on the microcomputer disk. The system worked very well for the duration of the project with the exception of a few minor problems. Daily analysis of the data permitted timely evaluation of the progress of the experiments and the status of equipment. The goal of unattended operation was achieved and would not have been possible without this system. A possible enhancement would be the addition of a relay board to the datalogger, thereby permitting a limited amount of remote control over process variables. 2 references, 4 figures.

15751 (EPRI-CS—4918-Vol.3, pp 18.1-18.15) **Performance improvement history of inadequately performing precipitators.** Musgrove, J.G.; Lane, W.R.; Wei, M.W. (Bechtel Power Corp.). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

This paper describes a successful effort to improve performance of three electrostatic precipitators at the Sandow Generating Station, Rockdale, Texas. Their installation in 1973 required an efficiency of 98%. Recent operation has not been satisfactory, allowing emissions in excess of their design value. As part of the Sandow Betterment Program, Bechtel Power Corporation was asked to study the performance of the precipitators and to make recommendations to improve their performance. The study included evaluation of operating data, performance testing, rapping acceleration tests, gas flow distribution tests, and precipitator modeling. Following evaluation of the tests, Bechtel made several recommendations; these included changes to the rapping system and the automatic voltage control system. The modifications, installed by Bechtel, have resulted in the following improvements: emission reductions of greater than 45% and opacity excursion reductions of over 75%. The tests conducted and details of improvements are presented in this paper. 7 figures.

15752 (EPRI-CS—4918-Vol.3, pp 19.1-19.12) **Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant.** Gal, E.; Murphy, M. (General Electric Environmental Services, Inc., Lebanon, PA). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Burlington Electric, J.C. McNeil Generating Station is the largest (50MW) wood fired power plant in the US. Mechanical cyclones and an electrostatic precipitator (ESP) are used in series to meet the stringent emission limit of 0.003 grains/acf. During initial operation, the particulate collection system experienced internal fires as well as plugging of cyclone and ESP hoppers. The cause of this problem was determined to be a combination of high combustible content of the fly ash, low cyclone efficiency resulting from lower than design gas flow rate, and improper operation of the fly ash removal system. A detailed system analysis was performed to identify operational modifications which were implemented with minimal disruption to plant operation. The corrective measures improved cyclone collection efficiencies, eliminated the fires and significantly improved performance and reliability of the fly ash removal system. Since the modifications were completed in October 1984, the particulate collection system has been operating smoothly, and has consistently exceeded particulate emission reduction requirements. 8 figures, 3 tables.

15753 (EPRI-CS—4918-Vol.3, pp 23.1-23.20) **Measurement of fugitive emissions in a coal-fired power plant.** Muleski, G.E.; Pendleton, F.J.; Rugenstein, W.A. (Midwest Research Institute, Kansas City, MO). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Coal-fired power plants contain several potential sources of airborne fugitive emissions, and utilities and regulatory agencies face an increasing need to estimate these emissions. This paper presents the methodology and results of a field testing program designed to characterize size-specific emissions from two sources at a modern power plant - the loading of fly ash into truck/trailer combinations and wind erosion of various surfaces within the plant's coal yard. Test results are used to determine annual emission rates which are compared to estimates using models available in the literature. 10 references, 7 figures, 8 tables.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 15798

15754 (EPRI-EL—2000-CCM) **Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual.** (Electric Power Research Inst., Palo Alto, CA (USA); Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Seattle, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada)). Jan 1987. 835p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920255.

A state-of-the-art software package is now available to help utilities determine procedures for operating power systems after onset of a major disturbance. This report can help programmers maintain and expand the stability analysis portion of the package.

15755 (EPRI-EL—2001-CCM) **Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual.** (Electric Power Research Inst., Palo Alto, CA (USA); Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Tukwila, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada)). Jan 1987. 354p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920257.

The extended transient-midterm stability package offers software for evaluating power system operations following major disturbances. This manual provides guidelines and input data descriptions for running three of the package's four primary programs.

15756 (EPRI-EL—2002-CCM) **Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual.** (Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Tukwila, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 118p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920263.

With new state-of-the-art software, utility personnel can determine procedures for operating power systems following major disturbances. This manual describes the input data required to develop initial values for the stability portion of the package.

15757 (EPRI-EL—2003-CCM) **Extended transient-midterm stability package: Support programs technical guide: Computer code manual.** (Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Tukwila, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 187p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920258.

A new state-of-the-art software package can help utility personnel analyze power system dynamics up to 5 min after onset of a major disturbance. This manual provides detailed guidelines for maintaining and expanding the power flow, transient grouping, and output analysis programs.

15758 (EPRI-EL—2004-CCM) Extended transient-midterm stability package: Test case manual: Computer code manual. (Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Tukwila, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 133p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920256.

Testing programs conducted by six utilities show this analysis package to be a useful tool for assessing power system stability following major disturbances. This report describes the use of the package with four test systems and includes sample outputs.

15759 (EPRI-EL—4610) Extended transient-midterm stability package: Final report. (Arizona Public Service Co., Phoenix (USA); Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering; Boeing Computer Services Co., Tukwila, WA (USA); ESCA Corp., Bellevue, WA (USA); Ontario Hydro, Toronto (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 572p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920254.

Today's power systems often operate under stressed conditions. The tools contained in this software package will help utility personnel determine safe loading and operating procedures under such conditions. They will also be useful in designing future systems that can withstand major disturbances.

15760 (LBL—22261) Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines. Scalise, D.T.; Fong, E.; Haughian, J.; Prechter, R. (Lawrence Berkeley Lab., CA (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.). Oct 1986. Contract AC03-76SF00098. 8p. (CONF-861114—27). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002544.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Specially formulated insulator materials with improved strength and high-voltage properties were developed and used for critical components of the flexible transmission lines to the TFTR neutral beam ion sources. These critical components are plates which support central conductors as they exit the high-voltage power supply and enter the ion source enclosure. Each plate acts both as a high-voltage insulator and as a pressure barrier to the SF_6 insulating gas. The original plate was made of commercial glass-epoxy laminate which limited the plate voltage capacity. The newly developed insulator is made of specially-formulated cycloaliphatic Di-epoxide whose isotropic properties exhibit increased arc resistance. It is cast in one piece with skirts which greatly increase the breakdown voltage. This paper discusses the design, fabrication and testing of the new insulator.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 17244, 17635

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 15398, 15402, 15845, 15875, 15970, 15972, 16004, 16005, 16018, 16022, 16023, 16029, 16033, 16035, 16061, 16074, 16077, 16078, 16080, 16082, 16084, 16085, 16090, 16091, 16092, 16098, 16100, 16101, 16102, 16104, 16105, 16107, 16118, 16119, 16120, 16132, 16133, 16134, 16135, 16138, 16139, 16140, 16142, 16145

15761 (BARC—1288) Low incremental control worth reload patterns for BWRs. (Bhabha Atomic Research Centre, Bombay (India)). 1985. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701255.

A new scheme for constructing reload patterns for BWR cores has been developed. This scheme is obtained essentially by rotating the axes of reflective symmetry of reload patterns through 45 deg. As compared to the current scheme, this scheme results in a more uniform distribution of worths among the control elements during their in-sequence withdrawal for taking the core to criticality. This new scheme also leads to improved safety characteristics like higher shut down margin, higher thermal margins during operation, and reduction in thermal shocks to the fuel assemblies. 6 refs., 12 tables, 5 figures.

15762 (BARC—1298) Tarapur dual cycle BWR - analysis of steam generator bypass incident. (Bhabha Atomic Research Centre, Bombay (India)). 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701261.

The falling of the cover plate located on the partition plate of the Secondary Steam Generator (SSG) of one of the Tarapur Atomic Power Reactors caused the bypass of the SSG tubes resulting in a reactor trip. Steady state flow analysis shown the hydraulic characteristics in the recirculation loop after the incident. Transient analysis shows the cause for the trip and the safety implications. 7 figs.

15763 (CONF-8610135—43) Flaw density examinations of a clad boiling water reactor pressure vessel segment. Cook, K.V.; McClung, R.W. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004077.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

Flaw density is the greatest uncertainty involved in probabilistic analyses of reactor pressure vessel failure. As part of the Heavy-Section Steel Technology (HSST) Program, studies have been conducted to determine flaw density in a section of reactor pressure vessel cut from the Hope Creek Unit 2 vessel [nominally 0.7 by 3 m (2 by 10 ft)]. This section (removed from the scrapped vessel that was never in service) was evaluated nondestructively to determine the as-fabricated status. We had four primary objectives: (1) evaluate longitudinal and girth welds for flaws with manual ultrasonics, (2) evaluate the zone under the nominal 6.3-mm (0.25-in.) clad for cracking (again with manual ultrasonics), (3) evaluate the cladding for cracks with a high-sensitivity fluorescent penetrant method, and (4) determine the source of indications detected.

15764 (CONF-8610135—55) BWR pipe crack remedies evaluation. Shack, W.J.; Kassner, T.F.; Maiya, P.S.; Park, J.Y.; Ruther, W.E. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004934.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

This paper presents results on: (a) the influence of simulated BWR environments on the stress-corrosion-craking (SCC) susceptibility of Types 304, 316NG, and 347 stainless (SS); (b) fracture-mechanics crack-growth-rate measurements on these materials and weld overlay specimens in different environments; and (c) residual stress measurements and metallographic evaluations of conventional pipe weldments treated by a mechanical-stress-improvement process (MSIP) as well as those produced by a narrow-gap welding procedure. Crack initiation studies on Types 304 and 316NG SS under crevice and non-crevice conditions in 289°C water containing 0.25 ppM dissolved oxygen with low sulfate concentrations indicate that SCC initiates at very low strains (<3%) in the nuclear grade material. Crack growth measurements on fracture-mechanics-type specimens, under low-frequency cyclic loading, show that the Type 316NG steel cracks at a somewhat lower rate (~40%) than sensitized Type 304 SS in an impurity environment with 0.25 ppM dissolved-oxygen; however, the latter material stops cracking when sulfate is removed from the water. Crack growth in both materials ceases under simulated hydrogen-water chemistry conditions (<5 ppB oxygen) even with 100 ppB sulfate present in the water. An unexpected result was obtained in the test on a weld overlay specimen in the impurity environment, viz., the crack grew to the overlay interface at a nominal rate, branched at 90° in both directions, and then grew at high rate (parallel to the nominal applied load). Residual stress measurements on MSIP-treated weldments and those produced by a narrow-gap welding procedure indicate that these techniques produce compressive stresses over most of the inner surface near the weld and heat-affected zones.

15765 **(CONF-8610135—59) Aging degradation of cast stainless steel.** Chopra, O.K.; Chung, H.M. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 42p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004939.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

A program is being conducted to investigate the significance of in-service embrittlement of cast duplex stainless steels under light-water reactor operating conditions. Microstructures of cast materials subjected to long-term aging either in reactor service or in the laboratory have been characterized by TEM, SANS, and APFIM techniques. Two precipitate phases, i.e., the Cr-rich α' and Ni- and Si-rich G phase, have been identified in the ferrite matrix of the aged steels. The results indicate that the low-temperature embrittlement is primarily caused by α' precipitates which form by spinodal decomposition. The relative contribution of G phase to loss of toughness is now known. Microstructural data also indicate that weakening of ferrite/austenite phase boundary by carbide precipitates has a significant effect on the onset and extent of embrittlement of the high-carbon CF-8 and CF-8M grades of stainless steels, particularly after aging at 400 or 450°C. Data from Charpy-impact, tensile, and J-R curve tests for several heats of cast stainless steel aged up to 10,000 h at 350, 400, and 450°C are presented and correlated with the microstructural results. Thermal aging of the steels results in an increase in tensile strength and a decrease in impact energy, J/sub IC/, and tearing modulus. The fracture toughness results show good agreement with the Charpy-impact data. The effects of compositional and metallurgical variables on loss of toughness are discussed.

15766 **(CONF-8611120—1) Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking].** Kassner, T.F.; Maiya, P.S.; Park, J.Y.; Ruther, W.E.; Shack, W.J.; Soppet, W.K. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004701.

From Seminar on BWR corrosion, chemistry, and radiation control; Palo Alto, CA, USA (10 Nov 1986).

The influence of dissolved oxygen, hydrogen, and various impurity anions on the stress corrosion cracking (SCC) susceptibility of sensitized Type 304 stainless steel (SS) and alternative piping materials such as Types 316NG and 347NG SS is being investigated in constant-extension-rate-tensile (CERT) tests and in cyclic loading experiments on fatigue precracked fracture-mechanics-type specimens at 289°C. In these experiments, the crack growth behavior of the materials is being correlated with the impurity concentration and the electrochemical potentials of Type 304 SS and platinum electrodes in simulated BWR normal operating environments ($\sim$ 200 to 300 ppb oxygen and $<$ 100 ppb of various oxyanions of halides added as acid or salts, at a total conductivity of <1 μS/cm).

15767 (EPRI-CS—4748, pp 4.1-4.22) **BWR control rod drive scram pilot valve monitoring program.** Soden, R.A.; Kelly, V. (NDT International, Inc., West Chester, PA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The control rod drive system in a Boiling Water Reactor is the most important safety system in the power plant. All components of the system can be verified except the solenoid operated, scram pilot valves without scramming a rod. The pilot valve mechanical works is the weak link to the control rod drive system. These pilot valves control the hydraulic system which applies pressure to the insert side of the control rod piston and vents the withdraw side of the piston causing the rods to insert during a scram. The only verification that the valve is operating properly is to scram the rod. The concern for this portion of the system is demonstrated by the high number of redundant components and complete periodic testing of the electrical circuits. The pilot valve can become hung-up through wear, fracture of internal components, mechanical binding, foreign material or chemicals left in the valve during maintenance, etc. If the valve becomes hung-up the electrical tests performed will not indicate this condition and scramming the rod is in jeopardy. Only an attempt to scram a rod will indicate the hung-up valve. While this condition exists the rod is considered inoperative. This paper describes a system developed at a nuclear power plant that monitors the pilot valves on the control rod drive system. This system utilizes pattern recognition to assure proper internal workings of the scram pilot valves to plant operators. The system is totally automatic such that each time the valve is operated on a half scram, a printout is available to the operator along with light indication that each of the 370 valves (on one unit of a BWR) is operating properly. With this monitoring system installed, all components of the control rod drive system including the solenoid pilot valves can be verified as operational without scramming any rods.

15768 **(EPRI-NP—4222-Vol.5) Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report.** Smee, J.L.; Turner, V.C. (London Nuclear Ltd., Niagara Falls, Ontario (Canada); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 24p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920217.

This report summarizes those studies conducted in 1984 and 1985 which dealt with intergranular attack and intergranular stress corrosion cracking in sensitized specimens of stainless steel 304 and Inconel 600 after exposure to the CAN-DECON LND-101A dilute chemical decontamination process. During this period London Nuclear initiated 3 test programs, 2 under BWR conditions and 1 under PWR conditions. In none of the programs was there any indication that the test specimens were more susceptible to SCC than the controls. The failure times for those specimens that were pulled to failure were essentially the same for the test specimens and controls. None of the specimens exhibited IGA.

15769 **(EPRI-NP—4817) Properties of colloidal corrosion products and their effects on nuclear plants: Final report.** Matijevic, E. (Clarkson Univ., Potsdam, NY (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Dec 1986. 68p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920218.

A number of different solid particles found in nuclear reactor coolant have been produced in the laboratory. Such particles result from corrosion processes at metal piping and component surfaces. The particles produced and studied in this work differ from those observed in power plant water in two respects: (1) they are all of one narrowly controlled particle diameter and particle shape; (2) they are all of one simple composition - such as magnetite or hematite. The methods for making new supplies of these particles are provided for use by those wishing to study, for example, how best to dissolve surface oxides during a decontamination of plant piping surfaces. The model oxides aid in sorting out the proper dissolution procedures by providing a well-defined simulation of each separate constituent of plant surfaces in a form where dissolution rates are easily measured. Measurements of the properties of magnetite, hematite, and nickel-iron-cobalt ferrites relevant to radioactive cobalt-60 transport have been made and are reported in summary form. Some of these properties studied are (1) cobalt adsorption as a function of temperature and pH; (2) magnetic properties to assess the ease of magnetic filtration; (3) dissolution rates by the commonly employed decontamination chemicals. Copies of 41 separate scientific journal publications resulting from this work are reproduced in microfiche in the back cover pocket.

15770 **(EPRI-NP—5001) Characterization of the performance of major LWR components: Final report.** Koppe, R.H.; Olson, E.A.J.; LeShay, D.W.; DeAngelis, D. (Stoller (S.M.) Corp., Boulder, CO (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 82p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920224.

This report presents results of a project conducted by The S.M. Stoller Corporation for EPRI. The purpose of the project was to characterize historical experience of US light water reactor units with respect to major component failures and modifications. This characterization can then be used as a benchmark for projections of

the impact of problems and refurbishments on units nearing or past the end of their original design life.

15771 **(EPRI-NP—5008) Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report.** Kassen, W.R. (NWT Corp., San Jose, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 70p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920225.

Since the use of sulfur hexafluoride as a tracer for identifying sources of primary to secondary leakage in PWR steam generators appeared to offer significant sensitivity advantages, the thermal stability of sulfur hexafluoride in water was evaluated at steam generator operating temperature. Significant decomposition was observed after 2 to 4 hours at temperature. Key decomposition products were fluoride and sulfide ions. Based on this observation and these limited test results, the use of SF_6 for PWR steam generator leak location can not be recommended at this time. A survey of 15 utilities was conducted in regard to their application experience with the helium tracer-mass spectroscopy technique for steam generator leak location. Although several successful steam generator integrity programs do not include use of this technique, it has proven to be a useful addition to the inspection program at some plants. No corrosion concerns appear to be associated with this technique.

15772 **(EUR—10043) Decontamination by water jet, chemical and electrochemical methods.** Gauchon, J.P.; Mordenti, P.; Bezia, C.; Fuentes, P.; Kervegant, Y.; Munoz, C.; Pierlas, C. (Commission of the European Communities, Luxembourg). 1986. 87p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750543.

The decontamination tests have been carried out on samples coming from representative specimens from primary circuit of the PWR and on samples coming from the emergency feed water piping of the German BWR (Isar). The oxide found in PWR primary loops can only be removed by a two steps process. The initial embrittling step is particularly effective in hot alkaline permanganate medium. Oxidation by ozone treatment is less effective. The second step involves chemical erosion of the metal in nitrofluoric acid in conjonction with ultrasonic agitation. Among the reagents used, only oxalic acid is suitable for electrolytic decontamination. Among the reagents possible for decontamination of the Isar specimens (ferritic steel lined with hematite) halogenous acid in mixture without or with oxygenated water, sulfuric acid, the formic acid/formaldehyde mixture are chosen. Metal erosion with high pressure jet as well as the decontamination efficiency on parts lined with hematite have made possible to determine the best conditions. 33 figs, 29 refs.

15773 **(NUREG/CR—4300-Vol.3-No.2) Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986.** Hutton, P.H. (Pacific Northwest Lab., Richland, WA (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering Safety). Jan 1987. Contract AC06-76RL01830. 13p. (PNL—5511-Vol.3-No.2). NTIS, PC A02/MF A01 - GPO. File Number TI87005635.

This report discusses technical progress for the period April 1986 to September 1986 for the NRC-sponsored research program concerned with "Acoustic Emission/Flaw Relationships for Inservice Monitoring of Nuclear Reactor Pressure Boundaries." Included in the discussion are the topics of AE monitoring of primary piping during reactor operation, substantiation of the AE signal identification method, development of AE/IGSCC relationships, and progress in establishing an ASTM AE standard and an ASME code appendix for on-line AE monitoring.

15774 **(EPRI-NP—4574-CCM-Pt.2-Ch.7-Vol.1) ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual.** Jones, D.B. (Levy (S.), Inc., Campbell, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Dec 1986. 61p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920228.

MICBURN-E is a multigroup pin cell lattice physics computer code designed for the burnup analysis of light water reactor fuel rods. It was specifically developed to handle fuel rods containing an initially homogeneous mixture of fuel (UO_2) and burnable absorber (Gd_2O_3) compositions. MICBURN-E features a fine mesh geometry model which makes it particularly suitable for the analysis of fuel rods which burn according to the phenomenon for "onion-skin" depletion effects. MICBURN-E employs integral transport theory based upon the method of collision probabilities to calculate neutron flux distributions and eigenvalues for cylindrical geometries. The primary application of MICBURN-E is to generate a burnable absorber data file containing effective microscopic absorption cross sections as a function of burnup for a pseudo nuclide. This file is then supplied as input to various assembly lattice physics codes including CPM-2, EPRI-CPM and CASMO-1. MICBURN-E is written entirely in FORTRAN and is supplied with a Nuclear Data Library which contains basic microscopic cross sections and burnup parameters for several nuclides.

15775 **(EPRI-NP—4574-CCM-Pt.2-Ch.12-Vol.3) ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual.** Jones, D.B.; Anderson, M.J. (Levy (S.), Inc., Campbell, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Dec 1986. 128p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920248.

NORGE-B2 is a computer code which provides linkage between the assembly lattice physics codes CPM-2, EPRI-CPM and CASMO-1 and the nodal simulation code SIMULATE-E. NORGE-B2 produces card image data files for hot and cold SIMULATE-E models. These cards contain cross-sectional data tabulated as functions of several operational parameters. The important parameters include exposure, moderator densities, control rod presence and power (Doppler). NORGE-B2 is run for each assembly fuel type in the SIMULATE-E model. It also generates card images containing kinetics data for the SIMTRAN-E computer code which links these same assembly lattice physics codes to the RETRAN code. NORGE-B2 is written entirely in FORTRAN.

15776 **A reduced-order model of boiling water reactor linear dynamics.** March-Leuba, J. (The Univ. of Tennessee, Dept. of Nuclear Engineering, 315 Estabrook Drive, Knoxville, TN 37916). *Nuclear Technology;* **75**: No. 1, 15-22(Oct 1986).

The development of a reduced-order linear model of the linear dynamic behavior of boiling water reactors (BWRs) is reported. The model is based on a detailed study of the various physical dynamic processes involved. The major results of the work are (a) the pole-zero configuration of the transfer function of this type of reactor has been determined, (b) a minimum of three zeros and four poles is needed to properly represent this transfer function, (c) these poles and zeros have been associated with reactor physical processes such as fuel heat transfer dynamics, and (d) a reduced-order linear model composed of only five equations has been developed. With the appropriate parameters, the model very accurately represents the dynamic behavior of BWRs predicted by fine-mesh computer calculations.

15777 **(EPRI-NP—4574-CCM-Pt.2-Ch.2-Vol.2) ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual.** Jones, D.B.; Anderson, M.J. (Levy (S.), Inc., Campbell, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1986. 135p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920247.

NORGE-B2 is a computer code which provides linkage between the assembly lattice physics codes CPM-2, EPRI-CPM and CASMO-1 and the nodal simulation code SIMULATE-E. NORGE-B2 produces card image data files for hot and cold SIMULATE-E models. These cards contain cross-sectional data tabulated as functions of several operational parameters. The important parameters include exposure, moderator densities, control rod presence and power (Doppler). NORGE-B2 is run for each assembly fuel type in the SIMULATE-E model. It also generates card images containing kinetics data for the SIMTRAN-E computer code which links these same assembly lattice physics codes to the RETRAN code. NORGE-B2 is written entirely in FORTRAN.

15778 **Nuclear fuels accounting interface: River Bend experience.** Barry, J.E. (Gulf States Utilities Co., Beaumont, TX). *Transactions of the American Nuclear Society;* **53**: 76(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This presentation describes nuclear fuel accounting activities from the perspective of nuclear fuels management and its interfaces. Generally, Nuclear Fuels-River Bend Nuclear Group (RBNG) is involved on a day-by-day basis with nuclear fuel materials accounting in carrying out is procurement, contract administration, processing, and inventory management duties, including those associated with its special nuclear materials (SNM)-isotopics accountability oversight responsibilities as the Central Accountability Office for the River Bend Station. As much as possible, these duties are carried out in an integrated, interdependent manner. From these primary functions devolve Nuclear Fuels interfacing activities with fuel cost and tax accounting. Noting that nuclear fuel tax accounting support is of both an esoteric and intermittent nature, Nuclear Fuels-RBNG support of developments and applications associated with nuclear fuel cost accounting is stressed in this presentation.

15779 **LWR Fuel failure detection using the grip sipping method.** Savolainen, K. (Imatran Voima Oy, Helsinki, Finland). *Transactions of the American Nuclear Society;* **53**: 87-88(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the case of fuel leakages, the sipping of the fuel assemblies to be reloaded often directly affects the length of the outage period. In this investigation the aim has been to develop a sipping method that can be used during normal fuel discharge. Hence, the sipping would not cause any substantial extension of the shutdown. Some experimental sipping equipment has been built and tested in the Loviisa pressurized water reactor power plant run by the Imatran Voima Power Company.

15780 **Performance of boiling water reactor fuel lead test assemblies to 35 MWd/kg U.** Rowland, T.C.; Ikemoto, R.N.; Gehl, S. (General Electric, San Jose, CA). *Transactions of the American Nuclear Society;* **53**: 89-90(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This joint Electric Power Research Institute/General Electric (EPRI/GE) fuel performance program involved thorough preirradiation characterization of fuel used in lead test assemblies (LTAs), detailed surveillance of their operation, and interim site examinations of the assemblies during reactor outages. The program originally included four GE-5 LTAs operating in the Peach Bottom-2 (PB-2) reactor. The program was later modified to include the pressurized fuel rod test assembly in the Peach Bottom-3 (PB-3) reactor. The program modification also included extending the operation of the PB-2 and PB-3 LTA fuel beyond normal discharge exposures. Results are summarized in the paper.

15781 **Optimization of spent-fuel storage equipment with extended burnup.** Anderson, C.K.; Burns, W.J.; Klotz, R.J. *Transactions of the American Nuclear Society;* **53**: 104-105(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Most utilities are pursuing extended fuel burnup for reasons attributable to the front end of the fuel cycle, however, increased burnup has several influences on the back end of the fuel cycle as well. For example extended burnup is one of the easiest and most economical ways to reduce storage requirements. As shown in the paper maximum at reactor (AR) storage requirements can be reduced by as much as 50% by the year 2000 by increasing fuel exposure ~ 3% per year from 1985 through 2000 [e.g., to ~45,000 MWd/ton heavy metal (HM) for pressurized water reactors and 38,000 MWd/ton HM for boiling water reactors], which in turn extends the useful life of existing storage capacity. A design objective of cask manufacturers is to simplify and minimize the maintenance and monitoring requirements for long-term storage. Taking credit for the known irradiation history in discharged fuel and the fact that this fuel has low residual reactivity is one way to achieve this objective.

15782 **Application of high-burnup experience to consolidation equipment design.** Matheson, J.E. (Babcock & Wilcox). *Transactions of the American Nuclear Society;* **53**: 108-109(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Fuel consolidation equipment being designed and built for use at repositories or reactor sites have the common design objectives of maximizing packing and throughput while minimizing contamination and personnel exposure. In establishing design parameters for these systems, it is necessary to consider limiting cases. The effects of burnup could impact adversely on the operation and throughput of consolidation equipment. If proper consideration is given during the design process to high-burnup fuel, however, these impacts can be minimized. For the limiting cases of 60 GWd/ton U for pressurized water reactor (PWR) fuel and 50 GWd/ton U for boiling water reactor fuel, the impact of burnup on equipment design is assessed and equipment design applications are suggested.

15783 **Steady-sate and load-follow characteristics of various BWR fuel designs.** Takei, K.; Kogai, T.; Matsumoto, T.; Umehara, H.; Uchida, M. *Transactions of the American Nuclear Society;* **53**: 219-220(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper describes the results of an irradiation study carried out in the Halden boiling water reactor (HBWR). The objective of this irradiation was to clarify the performance of various BWR fuel designs - helium prepressurization (0.3 MPa), pellet shape modification (annular and short-length annular) and barrier cladding (copper and zirconium) - under steady-state and load-follow operations.

15784 **Improved numerical method for subchannel cross-flow calculations.** Kaya, S.; Anghaie, S. (Oregon State Univ., Corvallis). *Transactions of the American Nuclear Society;* **53**: 263-265(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

COBRA-OSU is a fast running computer code for coupled kinetic and thermal-hydraulic analysis of nuclear reactor core subchannels, currently under development at Oregon State University. This code is a modified version of COBRA-IV with two major improved features. First, COBRA-OSU uses the Gaussian elimination method instead of Gauss-Seidel iteration for subchannel cross-flow calculation. Second, COBRA-OSU has an additional model for regionwise point reactor kinetics which includes all major feedback reactivity effects on calculation of the axial power profile during the course of a transient. This paper summarizes the improved numerical features of the COBRA-OSU code.

15785 **Equipment and procedural modifications to improve the reliability of Terry turbines used in nuclear service.** McNeill, H. *Transactions of the American Nuclear Society;* **53**: 380-381(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Terry turbines are used to drive auxiliary feedwater and emergency cooling water pumps for pressurized water (PWR) and boiling water reactor (BWR) nuclear power plants. The record indicates that of all nuclear plants in service or under construction, ~95% of the installations using turbo pump systems have called for Terry solid wheel turbines. A case study has been completed by the US Nuclear Regulatory Commission (NRC) to review past operating experience involving overspeed trips of PWR auxiliary feedwater (AFW) turbine-driven pumps, and BWR high-pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) turbine-driven pumps. As this study pointed out, that although the reliability of PWR AFW systems was of primary concern, the operational problems of AFW, HPCI, and RCIC systems were quite similar. Similarly, this paper is concerned with the PWR AFW systems with extension possible to BWR HPCI and RCIC systems.

Data are presented to show how modifications can be made to the AFW turbine system to improve reliability and address the deficiencies resulting from spurious overspeed trip, water induction, and delayed restart of PG governor systems. The effect of water induction has been evaluated and data are presented from tests conducted at Terry. Procedural improvements are discussed briefly.

15786 **Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant.** Williamson, K.; Hologa, J. (Carolina Power and Light, Southport, NC). *Transactions of the American Nuclear Society;* 53: 401(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this paper is to describe the development and implementation of visual weld acceptance criteria (VWAC) that provide design integrity and allow some imperfections in welds. The goal was to reduce the cost of welding at nuclear power plants. The Nuclear Construction Issues Group (NCIG) was initially conceived to address certain technical and administrative nuclear plant construction issues. In February 1985, NCIG issued a draft of Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants (NCIG-01). After numerous working sessions with the US Nuclear Regulatory Commission (NRC), comments were resolved and NCIG-01 Revision 2 was conceptually approved by the NRC in June 1985. The conceptual NRC approval of NCIG-01 triggered the Brunswick Steam Electric Plant (BSEP) engineering staff of Carolina Power and Light to develop VWAC specification. The specification included the basic requirements of NCIG-01. It is an inspection document defining the acceptability of welds. Full implementation began December 18, 1985. Estimates prior to VWAC established 2 h of post-weld preparation for every 1 h of welding. After field surveys it became apparent that with BSEP VWAC, 1 h of welding would require only 1/2 h of post-weld preparations.

15787 **Long-range goal setting in the nuclear utility industry.** Beard, P.M. (Institute of Nuclear Power Operations, Atlanta, GA). *Transactions of the American Nuclear Society;* 53: 431-432(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Institute of Nuclear Power Operation's (INPO's) programs support the industry's efforts to improve performance in nuclear plant safety and reliability. The success of these programs can best be measured by the progress of the industry. As utilities focused their attention on nuclear plant performance, the Institute's goal was to make sure its programs and activities provided the best possible support for these efforts. INPO continues to coordinate an industry-wide plant performance indicator program to assist member utilities in assessing station performance. Closely related to this effort is the nuclear industry's establishment of long-range plant performance goals. The US nuclear utility industry currently sends INPO quarterly data on 28 key performance indicators. INPO analyzes these data and provides periodic reports to its members and participants. Selected highlights of INPO's Performance Indicators for the US Nuclear Utility, dated June 1986, are discussed. Throughout 1985, INPO interacted with members, participants, and three external ad hoc review groups to refine the overall performance indicators and to develop background for each unit. By April 1986, each utility had developed long-term goals for each unit. By April 1986, each utility had developed long-term goals for most of the overall indicators. These goals represent a commitment to achievement of excellence when applied to the day-to-day conduct of plant operations, and provide a framework for action.

15788 **Startup range neutron monitor period-based transient monitor.** Chao, F.C.; Rowe, W.S. (General Electric Co., San Jose, CA). *Transactions of the American Nuclear Society;* 53: 440-441(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Current boiling water reactors use an intermediate-range neutron monitor (IRM) that covers neutron flux monitoring from $\sim 10^8$ to 10^{13} n/cm^2 s during reactor startup. This IRM provides multiple level ranges to cover the many decades of flux increase through manual up-range by the operator. Abnormal flux excursion transients are protected against by upscale trips (for both rod block and scram) on each range. The IRMs thus place high demand on operator action to avoid scram trip caused by normal flux increase. This new design was developed to substitute the IRM range switches to simplify plant operation and to improve plant availability. This design utilizes a linear amplifier and an RC-type filter. The neutron flux signal is led to pass through this amplifier/filter circuit, with the output compared to the original flux. The RC value and the amplifier gain can be so chosen and coordinated to correlate to a specific stable reactor period, designated as the setpoint.

15789 **Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines.** Sills, E.D.; Doster, J.M. (North Carolina State Univ., Raleigh). *Transactions of the American Nuclear Society;* 53: 258-260(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Current codes used for best-estimate reactor thermal-hydraulic analysis such as transient reactor analysis code (TRAC) and RELAP require long run times on large mainframe computers. The run times have been reduced using vectorized versions on supercomputers and parallelized versions on multi-CPU machines. However, these efforts have dealt with modifying the present algorithms to run on the new architectures rather than developing new specialized algorithms. In particular, the numerical solution of equations governing heat transfer and fluid flow in reactor systems involves the solution of large sparse matrix equations. The work being presented here involves the development and evaluation of algorithms to solve these large sparse matrix equations on parallel and vector machines. The objective of this work is to solve the matrix equations rapidly enough so that the reactor system simulation will run in real, or better than real time. With this real-time simulation ability using state-of-the-art thermal-hydraulics codes the models used in training simulators could be upgraded, complex reactor system design and analysis could be performed interactively on engineering workstations, and the run times required for licensing calculations could be significantly reduced. A three-equation drift-flux code named FLOC was written for use in evaluating algorithm performance.

15790 **LWR system simulation and transient analysis package on the Oregon State cyber-VE.** Greek, K.; Anghaie, S. (Oregon State Univ., Corvallis). *Transactions of the American Nuclear Society;* 53: 51-52(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the fall of 1985, the Control Data Corporation (CDC) awarded the OSU College of Engineering with a CDC 180/810 mainframe. The CDC 810 features an extremely large user-available address space (up to 2^{43} bytes) for each task, a new and versatile operating system (NOS/VE), and a dual state function that allows concurrent execution of NOS/VE and NOS/170 operating systems. Management of this facility ensures time and capability dedicated to the largest engineering codes. Modified from the latest CDC 7600 or Cray coding, the following nuclear power plant advanced simulation codes were selected for implementation due to their wide acceptance and specialization: RAMONA-3B, COBRA/TRAC, VIPRE. Benchmarking the 810 codes above against cases performed in FORTRAN IV demonstrated the conversion effort had been a success. Today, the OSU nuclear engineering department is the largest user of the 810 among all engineering departments at OSU. The current and projected demand on resources has prompted CDC to consider upgrading the 810 to an 830 system and to provide unlimited access to parallel processing.

15791 **Thermal-hydraulic issues in nuclear training.** Burchill, W.E.; Yackle, T.R. (Combustion Engineering, Inc.). *Transactions of the American Nuclear Society;* 53: 56-57(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Thermal-hydraulic phenomena that occur in liquid-cooled nuclear power reactors are a dominant subject addressed by nuclear training programs. The most dramatic illustration of the importance of this training, or conversely the consequences of its absence, was

the Three Mile Island accident. During that accident, many personnel, including plant operators and engineers failed to recognize the thermal-hydraulic phenomena that were taking place in the reactor coolant system. This failure can be largely attributed to inadequate training of all personnel in several fundamental thermal-hydraulic phenomena and their importance in a pressurized water reactor (PWR) coolant system. This paper addresses two major areas of consideration: (a) thermal-hydraulic phenomena which must be understood by various personnel in order to operate a nuclear power plant, and (b) thermal-hydraulic modeling, which must be included in real-time simulators used to train personnel. The degree of analytical sophistication involved in each of these training areas is strongly dependent on the training objective and the trainee group that is involved. All training applications, however, require that the symptoms of numerous thermal-hydraulic phenomena be understood.

15792 **Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987.** Sheron, B.W. (Nuclear Regulatory Commission, Washington, DC). *Transactions of the American Nuclear Society;* **53**: 57(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Research on the thermal-hydraulic performance of light water nuclear reactors in the US has been performed by both industry and government since commercial nuclear power first began. The purpose of this paper is to examine the history of thermal-hydraulic research in terms of changing regulatory needs, assess the current status of thermal-hydraulic knowledge and information deficiencies, and discuss those areas where future thermal-hydraulic testing will most likely be needed from a regulatory perspective.

15793 **Countercurrent flow and flooding with abrupt area changes.** Salim, T.; Yeung, W.S. *Transactions of the American Nuclear Society;* **53**: 535-537(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents a model and results for countercurrent flow through straight-tube and abrupt-area-change geometries. The model is reduced for the special case of flooding at the latter geometry and compared to data. Applications to light water reactor thermalhydraulics are noted.

15794 **Prediction of transient axial power distribution for calculation of the DNBR limit.** Samuels, J.N.; Anghaie, S. (Oregon State Univ., Corvallis). *Transactions of the American Nuclear Society;* **53**: 546-547(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Thermal-hydraulic margins are key determinants of plant operating flexibility and maximum attainable power rating, and can therefore impact on plant availability and capacity factor. Operating limits are established to ensure acceptable fuel conditions under normal operations as well as during abnormal operational transients or accident events. Examples of parameters that are limited to achieve these ends are linear heat generation rate, departure from nucleate boiling ratio (DNBR) in pressurized water reactors, and minimum critical power ratio in boiling water reactors. A region-wise point reactor kinetics (RWPRK) model has been incorporated into the COBRA-IV code which allows the axial power profile to vary during the transient event according to local thermal-hydraulic conditions and reactivity coefficients. The RWPRK model, a nodal model with the coupling coefficients set to zero, has been compared to other kinetics models by Lin et al. The results of this comparison indicate that the model can be employed under a variety of operational and accident conditions, and show that the result of calculations obtained by using this model are better than those obtained by using a single point reactor kinetics model and comparable to the results obtained using a one-dimensional space-time-dependent diffusion model.

15795 **Dual loop jet pump model for BWR stability analysis.** Peng, S.J.; Podowski, M.Z.; Lahey, R.T. Jr. (Middle South Services, New Orleans, LA). *Transactions of the American Nuclear Society;* **53**: 549-551(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Most of the existing computer codes for the stability analysis of boiling systems in general, and boiling water nuclear reactors (BWRs) in particular, employ a single-loop model in which the heater is treated as a single channel. Such an approach is sufficient as long as these codes are used to investigate the stability of rather simple experimental facilities equipped with a single electrically heated channel and a single recirculation pump. In the case of BWRs, however, more sophisticated models are necessary to properly model a multibundle core combined with a two-loop recirculation system. A new dual-loop model of the BWR recirculation system has been developed. The purpose of this paper is to present this model, in which two recirculation loops are considered individually, each consisting of a recirculation pump and bank of identical jet pumps. The dual-loop jet pump model has been developed and has been used to improve the modeling in NUFREQ-NP. The resulting code, NUFREQ-NP MOD.1, has been extensively tested and verified against the experimental data of the Peach Bottom-2 stability tests. Among others, the following conclusions can be drawn from the results: 1. The operation mode of recirculation pumps noticeably affects stability. 2. Dual-loop operating conditions are more stable than single-loop operation; also, symmetric operation is more stable than asymmetric operation.

15796 **Water reactor fuel element performance computer modelling.** Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983). 703p. Elsevier Science Pub. Co. Inc., 52 Vanderbilt Ave., New York, NY New York, NY.

This book presents papers on the computerized simulation of fuel elements in water cooled reactors. Topics considered include fission product release, fuel rod irradiation, the creep deformation of Zircaloy 4, fuel pellet fracture, the mechanical properties of uranium dioxide, friction, computer codes, fuel pins, fuel-cladding interactions, loss of coolant accidents, fuel sheath oxidation, fuel rod behavior predictions, and fuel bundle analysis codes.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 15402, 15456, 15765, 15768, 15769, 15770, 15771, 15772, 15773, 15774, 15779, 15781, 15782, 15784, 15785, 15787, 15789, 15790, 15791, 15792, 15793, 15794, 15796, 15864, 15874, 15875, 15904, 15964, 15969, 15970, 15971, 15972, 16004, 16005, 16006, 16006, 16007, 16008, 16013, 16017, 16018, 16021, 16022, 16023, 16024, 16025, 16026, 16027, 16030, 16032, 16033, 16034, 16036, 16038, 16041, 16045, 16046, 16051, 16052, 16053, 16054, 16055, 16056, 16060, 16061, 16062, 16064, 16065, 16080, 16081, 16083, 16085, 16086, 16087, 16088, 16089, 16093, 16094, 16099, 16100, 16102, 16103, 16104, 16105, 16106, 16107, 16116, 16119, 16122, 16123, 16126, 16127, 16129, 16130, 16134, 16135, 16139, 16140, 16141, 16142, 16143, 16145, 16454, 16455

15797 **(CONF-8611109—5) Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures.** Solyany, V.I.; Bibilashvili, Yu.K.; Dranenko, V.V.; Izrailevsky, L.B.; Levin, A.Ya.; Morozov, A.A. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (USSR); Vsesoyuznyj Nauchno-Issledovatel'skij Teplotekhnicheskij Inst., Moscow (USSR)). Nov 1986. 15p. NTIS (US Sales Only), PC A02. File Number DE87900497.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

Under accident conditions at NPP corrosive interaction between fuel clads and water steam can proceed rather intensively and significantly affect the safety and after-accident dismantling of a reactor core. In the USSR extensive studies have been performed into the corrosion behavior of Zr1%Nb WWER fuel clads in steam at 700 to 1500°C and exposure time 5 to 600 min. The data obtained are a basis for design modeling and estimates of the feasibility of the safety criteria. In the course of the program some features of the oxidation kinetics have been established that can influence the results of those estimates. This paper discusses one of the effects found in the course of the investigations, viz., multiple transitions on the weight gain curve for a high temperature corrosion of Zr1%Nb alloy.

15798 **(EDF-DER-RA—1985-1) DER 85: main facts.** (Electricite de France, 75 - Paris). 1986. 196p. (In French). NTIS (US Sales Only), PC A09/MF A01. File Number DE87750539.

This report presents the important facts among the studies carried out by the "Direction des Etudes et Recherches" (E.D.F.): new applications of electric power for customers, protection of environment, classical equipments for power plants and nuclear equipments, monitoring and control of power plants, electrical equipments, development and operation of electrical networks, informatics and office automation.

15799 **(EPRI-NP—5015) Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report.** Mann, G.M.W.; Castle, R. (Central Electricity Research Labs., Leatherhead (UK); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 81p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920244.

Solutions of NaCl (7 μg/kg - 70 mg/kg Cl) were pumped into an autoclave at 280°C and boiled in an annular crevice 50% filled with carbon fiber. The weight of NaCl concentrated in the crevice was monitored from the increase in salt concentration at the autoclave outlet after switching off the crevice heater. Salt accumulated initially in the crevice at a constant rate given by the product of the bulk concentration and the evaporation rate. Hideout continued until an equilibrium weight of salt was reached. The equilibrium weight depended primarily on the superheat in the crevice and weakly on the bulk concentration. On reducing power or bulk concentration, salt was released as long as the weight of salt in the crevice exceeded the equilibrium weight corresponding to the altered condition. Very little salt was released from the crevice during pressure changes. Subsequently the crevice was corroded using NH_4Cl solutions and some hideout tests with NaCl were repeated. The corroded crevice was less efficient at concentrating salt due to the presence of a steam blanket. A model of the concentration process was developed and applied to the tube/support plate crevice in PWR steam generators.

15800 **(GEND—058) Drop tests of the Three Mile Island knockout canister.** Box, W.D.; Aaron, W.S.; Shappert, L.B.; Childress, P.C.; Quinn, G.J.; Smith, J.V. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC07-76ID01570. 103p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87005195.

A type of Three Mile Island Unit 2 (TMI-2) defueling canister, called a "knockout" canister, was subjected to a series of drop tests at the Oak Ridge National Laboratory's Drop Test Facility. These tests confirmed the structural integrity of internal fixed neutron poisons in support of a request for NRC licensing of this type of canister for the shipment of TMI-2 reactor fuel debris to the Idaho National Engineering Laboratory (INEL) for the Core Examination R & D Program. This report presents the data generated and the results obtained from a series of four drop tests that included two drops with the test assembly in the vertical position and two drops with the assembly in the horizontal position.

15801 (IAEA-TECDOC—376, pp 51-58) **Small and medium power reactors in the Soviet power-generating industry.** Veretennikov, G.A. (Ministry of Power Engineering and Electrification, Moscow, USSR). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

In the two decades following the introduction of industrial-scale power-generating units at the Novo Voronezh and the Beloyarsk nuclear power plants, two main lines in the development of nuclear power stations emerged in the USSR nuclear power industry, based on the use of water-cooled, water-moderated vessel-type reactors and water-cooled, graphite-moderated channel-type reactors. In 1984, Soviet nuclear power plants accounted for 9.5% of the electric power generated. Over 140,000 million kW/h were generated (a growth of 27.5% compared with 1983), which is evidence of the significant, ever-increasing role of nuclear power stations in the overall picture of the country's power production. A substantial contribution to the USSR's nuclear power generation is made by stations with reactors of small and medium size (<= 440 MW(e) gross). Reactors of the WWER type, with an output of 440 MW(e) gross are installed at the Novo Voronezh, Armenia, Rovno and Kola nuclear power plants. At the Bilibino station four low-power (EGP-6 type) are installed. The installed power utilization factors of the units of these stations are in the range of 78-90%. The main characteristics of the two types of reactors mentioned above are given. The article includes a description in broad lines of the Soviet experience in using nuclear electric power and heating plants. The rigorism of the Soviet reactor safety regulations is stressed.

15802 **(KFKI—1986-40/G) Measurement of reactivity temperature coefficient by noise method in a power reactor.** Aguilar, O. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700820.

The temperature reactivity coefficient was estimated on the basis of noise measurements performed in a PWR. The magnitude of the coefficient was evaluated by relating the values of the APSD and CPSD between ex-core neutron detector signals and fuel assembly outlet thermocouple in the low frequency range. Comparison with $\delta rho/\delta T$ measurements performed in PWR by standard methods supports the validity of the results. 8 refs.; 4 figs.

15803 **(NUREG—1237) Technical specifications, Vogtle Electric Generating Plant, Unit No. 1 (Docket No. 50-424): Appendix "A" to license No. NPF-61.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Jan 1987. 456p. NTIS, PC A20/MF A01 - GPO. File Number TI87900482.

This technical specifications report presents information concerning the Vogtle Electric Generating Plant in the following areas: safety limits and limiting safety system settings; limiting conditions for operation and surveillance requirements; design features; and administrative controls.

15804 **(NUREG—1240) Technical specifications (Docket No. 50-400): Appendix "A" to License No. NPF-63.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Jan 1987. 470p. NTIS (US Sales Only), PC A20/MF A01 - GPO. File Number TI87900474.

This report presents specifications concerning the Shearon Harris Nuclear Power Plant in the areas of: safety limits and limiting safety system settings; limiting conditions for operation and surveillance requirements; design features; and administrative controls.

15805 **(NUREG/CR—4788) An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor.** Massoud, M. (Maryland Univ., College Park (USA). Dept. of Chemical and Nuclear Engineering; Nuclear Regulatory Commission, Washington, DC (USA). Div. of Reactor Systems Safety). Jan 1987. 270p. NTIS, PC A12/MF A01 - GPO. File Number TI87900512.

Natural Circulation phenomena in a simulated PWR was investigated experimentally and analytically. The experimental investigation included determination of system characteristics as well as system response to the imposed transient under symmetric and asymmetric operations. System characteristics were used to obtain correlation for heat transfer coefficient in heat exchangers, system flow resistance, and system buoyancy heat. Asymmetric transients were imposed to study flow oscillation and possible instability. The analytical investigation encompassed development of mathematical model for single-phase, steady-state and transient natural circulation as well as modification of existing model for two-phase flow analysis of phenomena such as small break LOCA, high pressure coolant injection and pump coast down. The developed mathematical model for single-phase analysis was computer coded to simulate the imposed transients. The computer program, entitled "Symmetric and Asymmetric Analysis of Single-Phase Flow (SAS)," were employed to simulate the imposed transients. It closely emulated the

system behavior throughout the transient and subsequent steady-state. Modifications for two-phase flow analysis included addition of models for once-through steam generator and electric heater rods. Both programs are faster than real time. Off-line, they can be used for prediction and training applications while on-line they serve for simulation and signal validation. The programs can also be used to determine the sensitivity of natural circulation behavior to variation of inputs such as secondary distribution and power transients.

15806 **Low-leakage fuel management in Sequoyah.** Strange, J.E. (Tennessee Valley Authority). *Transactions of the American Nuclear Society;* 53: 84-85(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Sequoyah is a two-unit nuclear power station. Each unit is a four-loop Westinghouse pressurized water reactor with 193 fuel assemblies and a rated thermal output of 3411 MW. Unit 1 has been refueled for cycle 4 and unit 2 is in the middle of cycle 3. Both cycles employ low-leakage loading patterns. A contractual commitment made it desirable to establish the enrichment needed for unit 1, cycle 5, even though cycle 4 had not begun operation. The TVA decided to use this opportunity to determine whether further reductions in radial leakage would be desirable. Thus two goals were set for the project. The first was to determine the reload enrichment requirements for unit 1, cycle 5. The second was to reduce the radial leakage by the maximum amount without exceeding the licensing limits for local power peaking. This paper includes a description of methodology, design criteria and guidelines, results for in-out-in fuel management, and results for in-in-out fuel management. Both objectives for the project were met. Vendor calculations verified that the cycle 5 in-out-in pattern was licensable.

15807 **Extended burnup: ex-core and accident considerations.** Snow, A.L.; Thornton, J.R. (Duke Power Co., Charlotte, NC). *Transactions of the American Nuclear Society;* 53: 103(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Original design-basis cycle average burnup referenced for fuel discharged from Duke Power Company's Catawba and McGuire units in safety analysis calculations is 11 450 MWd/ton U. Due to changes in the fuel cycle that have developed since the initial design of these units, significant economic benefits can be realized by extending cycle burnup beyond 11 450 MWd/ton. These benefits include decreases spent-fuel discharge rates, increased plant capacity factors, reduced spent-fuel storage and disposal requirements, and reduced worker radiation exposures. In order to achieve the benefits of extended burnup, numerous in-core thermal-hydraulic and reactivity safety analyses must be performed and documented in a Reload Safety Evaluation Report submitted to the US Nuclear Regulatory Commission NRC. Other technical concerns associated with extending fuel discharge burnups not addressed as part of the reload reports include fuel storage capability (both fresh and spent) and safety analysis report (SAR) off-site accident dose calculation impacts. This paper describes Duke Power Company's approach in addressing these accident and ex-core concerns in support of the McGuire and Catawba extended burnup programs.

15808 **Impact of high-burnup fuel cycles on fuel storage systems.** Massey, J.V.; Thomas, B.D.; Ferguson, B.W. (Nutech, San Jose, CA). *Transactions of the American Nuclear Society;* 53: 105-108(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The utility industry's trend toward higher burnup fuel cycles [50,000 MWd/ton heavy metal (HM)] will change the design parameters used in the development of fuel storage systems. The overall significance of these changes (in terms of technology and economics) is not completely understood. The intent of this paper is to investigate the effects of increased initial enrichment and burnup on typical high density pool storage, consolidated fuel storage, and dry storage. System capacity, shielding requirements, thermal hydraulics, criticality control, and cost are addressed, as applicable. Specific systems were selected for evaluation. The pool selected holds 1500 pressurized water reactor (PWR) storage sleeves in high-density racks.

15809 **Primary side stress corrosion cracking and remedial measures.** Theus, G.J. (Babcock & Wilcox, Alliance, OH). *Transactions of the American Nuclear Society;* 53: 207-208(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Primary side stress corrosion cracking (SCC) of Alloy 600 stream generator tubing in some recirculating pressurized water reactor steam generators has usually occurred in two locations: at the roll transition and expansion locations within the tube-sheets and at the apex and tangent areas of the tight radius U bends. Occasionally, other highly stressed areas have also suffered primary side SCC: at support plate tube intersections where secondary side denting has occurred and at the steam generator tube transition areas of explosively installed mini-sleeves. Laboratory data and operating performances of Alloy 600 tubing indicate that the factors affecting the susceptibility to this type of SSC, in decreasing order of importance, are high stresses, material microstructures, and operating temperatures. Remedial measures to correct these problems in newer plants include changing design and fabrication procedures, thus avoiding highly stressed areas of tubing, and changing tube manufacturing heat treating requirements, thus improving the microstructures. Alternate tube materials, such as Alloy 800, Monel 400, or austenitic stainless steels, have not suffered this type of failure.

15810 **Steam generator vessel and feedwater line integrity issues.** Bamford, W.H. *Transactions of the American Nuclear Society;* 53: 208-209(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Pressurized water reactors have now been operating commercially for over 25 yr, and during this time much has been learned about establishing and maintaining reliable operation. One of the best examples of this progress is the steam generator. A typical steam generator is shown, a large-diameter (10-ft) thin-walled (3- to 5-in.) pressure vessel. The heat transfer from the primary loop, which circulates water through the reactor vessel, to the secondary loop, which circulates water and steam through the turbine cycle, is accomplished through a large number of thin-walled tubes made of Inconel 600 or stainless steel. The primary loop is clad with stainless steel to minimize formation of corrosion products, and the water chemistry and operation are highly standardized and tightly controlled. The design and water chemistry control of the secondary systems are not standardized and are generally the responsibility of the utility and architect engineer. Guidelines for design and chemistry control have been issued by the nuclear power plant vendors and the Electric Power Research Institute. This paper chronicles three operational issues that have occurred in the steam generator pressure boundary and discusses the improvements that were developed to help protect against future occurrence. The issues are feedwater line cracking, water hammer, and girthweld cracking of the steam generator shell.

15811 **Improved water chemistry controls for minimizing degradation of materials.** Sawochka, S.G. (NWT Corp., San Jose, CA). *Transactions of the American Nuclear Society;* 53: 209-210(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Electric Power Research Institute and the Steam Generator Owners Group have sponsored several efforts to develop secondary water chemistry guidelines to minimize pressurized water reactor (PWR) steam generator tubing degradation. To develop these guidelines, chemical species known to accelerate corrosion of Alloy 600 were identified, and values for normal and abnormal chemistry situations were established. For example, sodium hydroxide was known to accelerate Alloy 600 intergranular attack stress corrosion cracking; thus, guidelines were developed for blowdown sodium concentrations in recirculating steam generator systems. Similarly, formation of acidic solutions, particularly as a result of chloride ingress at seawater sites, was known to accelerate denting; thus, chloride guidelines were established. A blowdown cation conductivity limit was established to minir.. ze concentrations of other anionic species. Guidelines also were developed for condensate and feedwater chemistry to minimize general corrosion

of system materials, thereby minimizing sludge and deposit buildup in the steam generators.

15812 **Review of secondary side tube degradation processes in PWR steam generators.** Hall, J.F. (Combustion Engineering, Inc., Chicago, IL). *Transactions of the American Nuclear Society;* 53: 210-211(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The NiCrFe Alloy 600 is the pressurized water reactor (PWR) steam generator tube material used in essentially all US PWRs, in most foreign PWRs, and thus is the tube material with the greatest service experience. Numerous laboratory investigations and service experience have demonstrated that Alloy 600 has good corrosion resistance in the steam generator secondary side environments expected under normal operating conditions. Experience in the laboratory and in the field, however, has demonstrated that even low levels of contaminants may concentrate in tubesheet crevices, in deep tubesheet sludge piles, and in tube support structure crevices to levels that promote several types of corrosion [pitting, intergranular attack, stress corrosion cracking, wastage] of the tube material. Low levels of contaminants, such as chlorides, sulfates, and oxygen, in the secondary system result from condenser cooling water and air in-leakage and from impurity releases from condensate polishers. This discussion reviews the corrosion-related secondary side tube degradation processes that have affected steam generator tubes in recent years and also mechanical tube damage resulting from fatigue and wear of the tube material.

15813 **Understanding and protecting steam generator materials.** Ballinger, R.G. (Massachusetts Institute of Technology, Cambridge). *Transactions of the American Nuclear Society;* 53: 211(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Solid solution-strengthened nickel base alloys have been used for nuclear stream generator tubing in pressurized water reactors since the beginnings of commercial nuclear power. The purpose of this paper is to recap and update the authors understanding of the relationship between processing, resulting structure, and properties for Alloy 600 and to discuss the requirements for optimized performance in both primary and secondary environments. Potential replacement materials and their performance will be discussed. Also discussed is the role and importance of system chemistry, bulk and local, and control and its relationship to performance. A discussion of potential mechanisms of environmentally assisted failure is also discussed.

15814 **O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry.** Yato, T.; Hagino, S.; Kawashima, Y.; Kamei, Y.; Honda, Y. (Mitsubishi Metal Corp.). *Transactions of the American Nuclear Society;* 53: 218-219(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Fuel of UO_2 containing a high content of gadolinia is planned to be used in pressurized water reactor high-burnup fuels. The UO_2-Gd_2O_3 fuel is in the state of solid solution in which a part of the uranium atoms in UO_2 are substituted by gadolinium atoms. The oxygen-to-metal (O/M) ratio of the solid solution is one of the most important factors affecting fuel properties and irradiation performance. The M represents metals of uranium and gadolinium. The oxygen-to-uranium O/U ratio of UO_2 fuel is usually measured by gravimetric analysis during oxidation of UO_2 to U_3O_8. In contrast with UO_2, it is difficult to measure the O/M ratio of $(U,Gd)O_2$ solid solution by gravimetry, because it is not clear whether the oxidation product of the solid solution is U_3O_8-Gd_2O_3 mixture, $(U,Gd)_3O_8$, or others. In this study, the measuring method of the O/M ratio of the solid solution by gravimetry has been developed and evaluated by examining oxidation behavior and oxidation products of the solid solution.

15815 **Pin Power prediction in the Westinghouse Advanced Nodal Code.** Liu, Y.S.; Meliksetian, A.; Casadei, A.L. *Transactions of the American Nuclear Society;* 53: 246-247(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Westinghouse has employed a nodal code, PALADON, for core design for many years. The code has been used in conjunction with a fine-mesh finite difference code to provide benchmarking of power distribution and, if necessary, a basis for albedo adjustments. An Advanced Nodal Code (ANC) has been developed employing the nodal expansion method for nodal coupling coefficients, the equivalence theory for cross-section homogenization, and a group theory method for pin power recovery. This methodology enables the use of a single three-dimensional core model for all design applications and eliminates the need for development of redundant core models for benchmarking and albedo adjustment. A key factor to the success of the ANC is its accurate and efficient prediction of the local pin power and thimble flux.

15816 **Method of baffle/reflector region homogenization.** Rathkopf, J.A.; Liu, Y.S. *Transactions of the American Nuclear Society;* 53: 247-249(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Albedo boundary conditions are commonly used in coarse-mesh nodal codes as a substitute for the baffle and reflector, thereby reducing the size of the problem and the corresponding computational expense. Analytical expressions for one-dimensional albedos are easily obtained, but, in the case of two-dimensions, more complicated models are used with limited success. The Westinghouse Advanced Nodal Code (ANC) allows representation of the baffle and reflector region by homogeneous nodes beyond the fuel assemblies. This summary describes a procedure developed to obtain baffle/reflector constants that will reproduce the results of fine-mesh diffusion theory analysis of cores with explicitly modeled baffles and reflectors. The method does not attempt to reproduce transport effects - the emphasis of other recent work. These homogenized baffle/reflector constants, which incorporate the discontinuity factor of Koebke's equivalence theory of homogenization, have been applied to nodal calculations with great success.

15817 **Improvement in steam generator level control.** Masuda, J.; Ohtake, M.; Haneda, T. (Mitsubishi Atomic Power Industries, Inc., Tokyo, Japan). *Transactions of the American Nuclear Society;* 53: 376-377(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Statistics of the scram events of Japanese pressurized water reactor (PWR) plants show that unnecessary scrams due to failures in the steam generator feedwater system contribute about one-fourth of the total scrams. To reduce scram frequency due to those failures, measures have been taken for operating plants as well as new plants. Expansion of automation in steam generator water level control is one of the measures, since the failure of the feedwater control at lower power, mostly on manual control, contributed about 40% of total unnecessary scrams due to feedwater system failures. This paper discusses the improvements that have been made, especially automation of steam generator water level control for Japanese PWR plants.

15818 **Evaluation of feedwater systems for reactor scram reduction.** Knell, K.C.; Hanley, N.E.; Banerjee, A.K. (Stone & Webster Engineering Corp., Boston, MA). *Transactions of the American Nuclear Society;* 53: 377-378(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Deficiencies in the feedwater and condensate system were identified as the cause or contributor to 28% of all reactor scrams in 1985. A number of options are currently available to enable nuclear utilities to increase plant availability and reliability through a reduction in reactor scrams and by limiting secondary plant transients that challenge safety systems. Options for identifying areas of improvement include performing precise engineering evaluations of feedwater pumps, control systems, control system upgrades, and performing transient analysis. This paper outlines and describes three areas the nuclear industry can pursue to evaluate the feedwater system for improved plant performance and a reduction in

reactor scrams. Problem areas in the secondary plant with the potential to cause reactor scrams include misoperation of feedwater components and instrumentation, as well as secondary system transients resulting from condensate and condenser system failures.

15819 **Palo Verde full-range feedwater control system operating experience.** Singh, G.; Elimar, R. (Combustion Engineering, Inc.). *Transactions of the American Nuclear Society;* 53: 378-380(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

High and low steam generator level trips are significant contributors to plant unavailability during low-power operation. This is caused by the destabilizing characteristics of the steam generation process and the lack of accurate steam flow and feed flow indications. The process is further complicated by simultaneous change of plant parameters like steam flow and primary power which affect the steam generators' response. To eliminate this problem, the Arizona Public Services' Palo Verde Nuclear Power Station has installed Combustion Engineering's Full-Range Feedwater Control System. This system has been designed to automatically control steam generator level at low powers, high powers, during feedwater valve transfers, and during the post-trip steam generator refill mode. The control system has passed all acceptance tests during startup warranty tests and is currently in commercial operation at Palo Verde Unit 1. Operating experience with the system in automatic has allowed operation of Unit 1 during 1985 without any reactor trips associated with steam generator level control. This has contributed to scram reduction and improvement of plant availability. The operating experience associated with the system is outlined in this paper.

15820 **Bechtel automated control of design document data.** Hollingshaus, H. *Transactions of the American Nuclear Society;* 53: 384(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Concern for nuclear power plant safety has resulted in many design features that complicate the licensing, operation, and maintenance of nuclear plants. To manage and control the design effectively, Bechtel has developed an integrated design document data base that provides efficient support of the plant during all phases of its life. The program runs on the IBM System 38, but can also be downloaded to an IBM PC to save storage and connect time. It is interactive and can accommodate multiple users at various locations. Although primarily developed to manage design changes resulting from the regulatory process and use of a fast track construction schedule, the data base will provide operations and maintenance personnel with qualifications status and pertinent data for each piece of equipment, including all electrical devices and a list of all associated design documents.

15821 **Baseline characterization of electrical circuits to support plant life extension.** Phelps, R.L. Jr.; Wells, K.P.; Dinsel, M.R.; Quinn, E.L. Jr.; Meininger, R.D. (Southern California Edison Co.). *Transactions of the American Nuclear Society;* 53: 395-396(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

To (a) provide data on the relative condition of certain electrical cable in use on one of its nuclear plants, and (b) gain experience with state-of-the-art equipment and procedures for obtaining these data under the US Department of Energy (DOE) technology transfer to industry program, Southern California Edison Company (SCE) performed a program in association with EG & G Idaho, Inc., at the San Onofre Nuclear Generating Station (SONGS), Unit 1 during the Cycle IX Refueling Outage in April and May 1986. The program obtained baseline data for characterization of electrical circuits utilizing the Electrical Circuit Characterization and Diagnostic (ECCAD) System, developed by EG & G Idaho, Inc. under contract to the DOE. The ECCAD system and the SONGS 1 program to utilize it are described to show a method for characterizing electrical circuits by comparison to baseline data or to data from similar circuits. This demonstrates a capability to identify the effects of environment and aging on electrical circuits. This technique was shown to have both short-term (diagnostic) potential and long-term (characterizing aging effects) potential for use in applications where electrical circuits may be subjected to environmental conditions that can lead to cable degradation.

15822 **Fast neutron fluxes in pressure vessels using Monte Carlo methods.** Edlund, M.C.; Thomas, J.R. (Virginia Polytechnic Institute and State Univ., Blacksburg). *Transactions of the American Nuclear Society;* 53: 396-397(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The objective of this project is to determine the feasibility of calculating the fast neutron flux in the pressure vessel of a pressurized water reactor by Monte Carlo methods. Neutron reactions reduce the ductility of the steel and thus limit the useful life of this important reactor component. This work was performed for Virginia Power (VEPCO). VIM is a continuous-energy Monte Carlo code which provides a versatile geometrical capability and a neutron physics data base closely representing the EDNF/B-IV data from which it was derived.

15823 **Vibration monitoring/diagnostic techniques, as applied to reactor coolant pumps.** Sculthorpe, B.R.; Johnson, K.M. (Florida Power & Light Co., Ft. Pierce). *Transactions of the American Nuclear Society;* 53: 397-398(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

With the increased awareness of reactor coolant pump (RCP) cracked shafts, brought about by the catastrophic shaft failure at Crystal River #3, Florida Power & Light Company, in conjunction with Bently Nevada Corporation, undertook a test program at St. Lucie Nuclear Unit #2, to confirm the integrity of all four RCP pump shafts. Reactor coolant pumps play a major roll in the operation of nuclear-powered generation facilities. The time required to disassemble and physically inspect a single RCP shaft would be lengthy, monetarily costly to the utility and its customers, and cause possible unnecessary man-rem exposure to plant personnel. When properly applied, vibration instrumentation can increase unit availability/reliability, as well as provide enhanced diagnostic capability. This paper reviews monitoring benefits and diagnostic techniques applicable to RCPs/motor drives.

15824 **Plant experience with temporary reverse osmosis makeup water systems.** Polidoroff, C. (Pacific Gas & Light). *Transactions of the American Nuclear Society;* 53: 402(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Pacific Gas and Electric (PG & E) Company's Diablo Canyon Power Plant (DCPP), which is located on California's central coast, has access to three sources of raw water: creek water, well water, and seawater. Creek and well water are DCPP's primary sources of raw water; however, because their supply is limited, these sources are supplemented with seawater. The purpose of this paper is to discuss the temporary, rental, reverse osmosis systems used by PG & E to process DCPP's raw water into water suitable for plant makeup. This paper addresses the following issues: the selection of reverse osmosis over alternative water processing technologies; the decision to use vendor-operated temporary, rental, reverse osmosis equipment versus permanent PG & E-owned and -operated equipment; the performance of DCPP's rental reverse osmosis systems; and, the lessons learned from DCPP's reverse osmosis system rental experience that might be useful to other plants considering renting similar equipment.

15825 **Secondary-side chemical cleaning of Oconee nuclear station steam generators.** Snow, A.L. (Duke Power Co., Charlottesville, NC). *Transactions of the American Nuclear Society;* 53: 403-404(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

From as early as 1977, the Oconee Unit 1 once-through steam generators (OTSGs) have experienced tube defects traceable to the presence of magnetite (Fe_3O_4) debris lying primarily on the tube support plates. Likewise, the Oconee Unit 2 steam generators began to experience an increase in pressure drop in 1982, also at-

tributable to secondary-side magnetite deposits. The chemical cleaning system serves to mix and heat the cleaning, rinse and passivation solutions, and then inject and circulate the solutions in the steam generator. Next, the solutions are drained and transferred to temporary waste storage tanks.

15826 **Neutron and gamma-ray flux calculations for the VENUS PWR engineering mockup.** Fero, A.H. (Westinghouse NTSD). *Transactions of the American Nuclear Society;* 53: 405-408(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper describes the analysis of neutron and gamma-ray fluxes in the VENUS pressurized water reactor (PWR) engineering mockup benchmark experiment (SCK/CEN Mol, Belgium). This mockup is unique in two ways. It is the first mockup to correctly represent the heterogeneities which exist in the PWR core peripheral fuel assemblies, core baffle, core barrel, and neutron pad. This is accomplished by using low-enrichment (3.3 and 4.0 wt% ^{235}U) fuel pins and a representative PWR fuel assembly geometry (15 x 15) with full thickness Type 304 stainless steel reactor internals structures located with representative water gap spacing. The VENUS mockup also represents locally the stairstep geometry of the core periphery. Second, the VENUS mockup is extremely well characterized in terms of as-built dimensions, material compositions, and pin-by-pin core power distributions. Analysis of VENUS was performed using the methods and procedures used to analyze commercial PWRs. Specifically, two-dimensional discrete-ordinates transport theory calculations were performed using the DOT-IIIW code.

15827 **Calculations for determining appropriate key radionuclides for failed fuel analysis.** Harris, R.D.; Binney, S.E. (Oregon State Univ., Corvallis). *Transactions of the American Nuclear Society;* 53: 429-430(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US Nuclear Regulatory Commission requires that a group of key radionuclides that may be indicative of the extent of core damage be analyzed under abnormal core conditions. However, establishing this group of radionuclides is left to the discretion of the licensee. The purpose of this work was to evaluate the effectiveness of the key radionuclide concept and to determine if this type of analysis would aid the licensee in establishing this group of key radionuclides. A design-basis accident in a pressurized water reactor (PWR) was chosen for this evaluation. This study has shown that an appropriately selected group of key radionuclides can provide information on the state of the reactor core during and after an accident situation. The method used could aid the licensee of a nuclear power plant in the selection of key radionuclides. The pertinent factors in key radionuclide selection are the background count rate, the interference-free photopeak energy resolution, the minimum count time required for detection, and the necessary count rate reduction factor.

15828 **Search of excellence: the problems of material aging and reliability in an older nuclear unit at the Southern California Edison company.** Ray, H.B. (Southern California Edison Co., San Clemente). *Transactions of the American Nuclear Society;* 53: 435-437(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Southern California Edison Company (SCE) is the majority owner and the operator of the three-unit San Onofre Nuclear Generating Station (SONGS) located on the Pacific coast between Los Angeles and San Diego. Its major goals for SONGS are reflected in the motto, Safety, Compliance and Excellence, which follow the company initials, SCE. The goal of excellence in unit operations includes the need to ensure that incidents that challenge plant safety systems do not occur. On November 21, 1985, an incident occurred at San Onofre Unit 1 which involved two separate material condition deficiencies. This incident represented a challenge to plant safety systems which was avoidable, but which had not been prevented by the authors existing programs for monitoring plant material condition. With input and suggestions from the US Nuclear Regulatory Commission (NRC) regional management, SCE developed and implemented two programs that are intended to achieve specific goals for reestablishing and systematically maintaining the material condition throughout the plant in safety-related and in nonsafety-related areas at a standard which will maintain for the next 20 yr the record of safe operation of San Onofre Unit 1 which it has accumulated in its first almost 20 yr.

15829 **PC-based flux mapping data collection system.** Fahley, J.M. (Pacific Gas and Electric, Avila, Spain). *Transactions of the American Nuclear Society;* 53: 443(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Diablo Canyon Power Plant if owned and operated by Pacific Gas and Electric Company of California. The plant consists of two Westinghouse design pressurized water reactors (PWRs). Unit 1 began commercial operation in May 1985, Unit 2 in March 1986. Many personal computer (PC)-based engineering applications have been developed at the site to perform calculations required by plant operations and surveillance testing. This paper addresses the development and implementation of a PC-based system which collects and transmits data for meeting Technical Specification surveillance requirements on reactor core conditions.

15830 **Use of the DSNP simulation language in high-seed dynamic simulation of nuclear power plants.** Yeh, H.C.; Kastenberg, W.E.; Catton, I. (Univ. of California, Los Angeles). *Transactions of the American Nuclear Society;* 53: 46-48(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper focuses on two possible DSNP applications in high-speed dynamic simulation of nuclear power plants. Because of the high-level language drawback, it is not designed for high-speed simulation purposes, which was stated very clearly in its development objective. To overcome this shortcoming by using parallel processing, and considering the advantages of a high-level reactor simulation language and the supporting language for the array processor, it will be profitable to use DSNP to generate backbone FORTRAN programs and then to tailor the FORTRAN programs to accommodate the calling program to the array processor. The preliminary results of this approach are shown. Another possible way of exploring the features of SEASNET with the application of DSNP is to (a) prepare the DSNP source program on a PC/AT or PC/RT (more preferable); (b) compile, link, and execute on the server machine, IBM 4381 or FPS-164; and (c) receive the computing results and display graphically with the aid of a graphics package running on a PC/AT or PC/RT. The dynamics of a preasurized water reactor (PWR) nuclear power plant are simulated.

15831 **U-tube steam generator model for the DSNP language.** Welch, G.E.; Dugan, E.T.; Vernetson, W.G. (Univ. of Florida, Gainesville). *Transactions of the American Nuclear Society;* 53: 49-50(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A U-tube steam generator (UTSG) model has been developed for the dynamic simulator for nuclear power plants (DSNP). The model is designed to predict the behavior of UTSG variables during transients that are at least as severe as those which may be anticipated during normal power plant operation, while maintaining those features that make DSNP an attractive method for transient simulation in the university environment. The relatively simple models currently available in the DSNP code package are suited to predicting the tendency of global power plant parameters economically, both in computer execution time and man-hour investment per simulation.

15832 **Sound measures feedwater temperature within 1°F consistently.** Imai, M.; Bistrian, J.; Erickson, G. (Consolidated Edison Co. of New York, NY). *Transactions of the American Nuclear Society;* 53: 523-524(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The speed of sound can be used to measure the temperature of feedwater in a power plant. This method is accurate and can be

better than thermocouples (T/Cs) or resistance temperature detectors (RTDs). It can measure to an accuracy of +/- 1.0°F, is very reliable, and has demonstrated that drift is far less than existing RTDs. Sonic temperature should be used for plant calorimetrics. One advantage of using the speed of sound in water to measure temperature is that the same instrument, the ultrasonic leading edge flowmeter (LEFM), can be used to measure both feedwater flow and temperature. Since the LEFM was first installed at Indian Point Unit 2 in 1979, it has been used to measure feedwater flow. Drift problems seen in RTDs or T/Cs have not been exhibited by the LEFM. Data obtained during a plant startup were used to generate the temperature-velocity relationships and additional data were obtained over two months to demonstrate the reliability of this new method to obtain feedwater temperature. Excellent accuracy, reliability, and repeatability of this method have been demonstrated by this study.

15833 **Calculation of once-through steam generator performance using RELAP5/MOD2.** Nithianandan, C.K. (Babcock & Wilcox Engineering Corp., Boston, MA). *Transactions of the American Nuclear Society;* **53**: 524-526(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Three steam generator performance tests from the Babcock & Wilcox (B & W) 19-tube, once-through steam generator (OTSG) test facility were simulated using RELAP5/MOD2 - cycle 36.10, and the results were compared with the experimental data. RELAP5 predicted the steam generator steady-state performance reasonably well. However, further refinements to the boiling and the post-critical heat flux (CHF) heat transfer would improve the capability to correctly predict OTSG behavior.

15834 **Turbulence force correlation of PWR steam generator tube bundle flow.** Hu, M.H.; Alemberti, A. *Transactions of the American Nuclear Society;* **53**: 543-544(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Westinghouse Model D4 steam generator uses a counterflow preheater in the lower bundle. A 2/3-scale test model simulated the full 180 deg of the first pass of the preheater, including the feedwater nozzle, water box, Plates, A, B, and D and the vertical partition plate. The test model consists of the full complement of 4578 straight tubes in the cold-leg side of the steam generator, they are of square pitch, and 49 tube rows by 114 tube columns. The tube outside diameter is 0.5 in. with a tube pitch of 0.7083 in. The 2/3-scale model is part of a program to modify counterflow preheat steam generators to reduce flow-induced vibration and wear level in the preheater.

15835 **Streamlined one-pass modelling.** Jones, J.H.; Harne, R.L.; Firth, K.J.; Meyer, G.A. (Babcock & Wilcox Engineering Corp., Boston, MA). *Transactions of the American Nuclear Society;* **53**: 545-546(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Streamlined one-pass models provide an alternative to the standard type of one-pass models for departure from nucleate boiling ratio (DNBR) studies, which require a large number of computer simulations. The standard one-pass models simulate the limiting subchannel (subchannel in which minimum DNBR occurs), a ring of subchannels around the limiting subchannel, the remainder of the limiting bundle, and the remainder of the core. Typically, these standard models use from 8 to 12 channels and ~20 cross-flow gaps. Babcock & Wilcox (B & W) has developed streamlined one-pass models that require approximately one-half the number of channels and ~20% of the computer resources as the standard one-pass models. These streamlined models are applicable in one-pass analysis codes such as the B & W code LYNXT and the Electric Power Research Institute VIPRE code. Streamlined one-pass models are particularly suited to extensive studies wherein computer cost and turnaround are critical, without sacrificing DNBR accuracy. Examples of such studies are reactor protection operating limit determination, limiting transient selection, and scoping studies. Moreover, streamlined one-pass models make it possible to perform DNBR studies on personal computers (PCs) using PC-adapted codes such as COBRAPC.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 15801, 16031, 16063, 16108

15836 **(IAE—4067/4) Experimental investigation of closed-type convective thermosyphon thermal performance as applied to a molten salt power reactor.** Ignat'ev, V.V.; Kersnovskij, S.V.; Novikov, V.N.; Smirnov, Yu.B.; Surenko, V.I.; Shcherbanyuk, O.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. 33p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700702.

The technique for studying integral thermal characteristics of a closed thermosyphon (CT) using a model fluid (distilled water) permitting to determine peculiarities and possibilities of CT as applied to a molten salt power reactors are suggested. Regularities of heat exchange in vertical and inclinated thermosyphon are considered. Dependences to determine heat exchange efficiency are obtained. It is pointed out that vertical thermosyphons can transfer thermal power of > 100 kW at the average difference in temperatures of internal surface of thermosyphon wall in heating and cooling zone equal to 200 deg C. 15 refs.; 12 figs.; 6 tabs.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 15873, 16137, 16146

15837 **(BARC—1295) BOXER3: a three dimensional integral transport code for PHWR supercell.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 38p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701260.

This report describes BOXER3, three dimensional computer code for solving the integral transport equation. The code uses a combination of the collision probability and the interface current methods. It uses mixed rectangular and cylinderical coordinates and can therefore treat cylindrical fuel channels and reactivity devices within a rectangular 'supercell' of a Candu PHWR. The report describes the details of computation of collision probabilities and the solution of the neutron balance equations. The latter can be done iteratively or by direct matrix inversion. It is shown that the iteration scheme is convergent. Comparisons of the results of BOXER3 and those obtained by other transport and diffusion codes in one, two and three dimensional geometries are also presented. 12 refs., 7 tables, 5 figures.

15838 (EPRI-CS—4748, pp 1.1-1.18) **Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants.** Loewen, T.; Perricone, F. (Ontario Hydro, Toronto). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This paper describes rotating equipment vibration monitoring and analysis systems used in Ontario Hydro Nuclear Plants. The approaches to monitoring vary from periodic manual methods with portable equipment to on-line computer managed systems. The main function of the monitoring systems is the detection and diagnosis of rotating equipment defects at an early stage. The main objective is to provide information to plant personnel for maintenance planning and assessment, resulting in substantial savings in maintenance costs, improved equipment reliability, and reduced maintenance personnel exposure to radiation. Also, case histories are presented to illustrate the application of vibration monitoring methods and their effectiveness. 3 references, 6 figures.

15839 (IAEA-TECDOC—378, pp 165-175) **Financial risk assessment for nuclear generation expansion planning. A utility view.** Titus, G.L. (New Brunswick Electric Power Commission, Fredericton, Canada). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

In this paper the author gives a utility view of the nuclear generation expansion planning and financial risk assessment done by the New Brunswick Electric Power Commission in order to enter the nuclear power generation age, when its first reactor became critical (July 25, 1982). The system development philosophy, as well as the economic, technical, and environmental considerations of New Brunswick Power are mentioned. The risk/benefit optimization and the unit as such are described. The conclusions for future expansion planning are drawn. 2 figs, 1 tab.

15840 **Search for excellence - goal setting, Ontario Hydro Nuclear Generation experience.** Niitenberg, A.; Andersen, W.J. (Ontario Hydro, Canada). *Transactions of the American Nuclear Society;* **53**: 432-433(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Ontario Hydro, a provincial government-owned utility which supplies electrical energy to the province of Ontario provides over 40% of the total generation from nuclear units. Much of its success in operating nuclear generating stations is attributed to the use of a highly developed, well-proven Management by Objectives program. This program is based on a systematic approach involving establishment of objectives, measurement of results, identification and resolution of problems, and continuous feedback of operating experience to designers, manufacturers, and researchers. The established objectives are as follows: 1) worker safety objectives; 2) public safety objectives; 3) environmental protection objectives; 4) reliability objective; and 5) product cost objective. Wherever practical, the above objectives have been quantified as standards and targets. Quantified standards are defined to help in assessing the Ontario Hydro performance compared with relevant performance outside of Ontario Hydro. Quantified targets are defined to help put a handle on the effectiveness of each station for a specified year. An annual review of performance compared with standards and targets is mandatory.

15841 **Development and applications of core simulation for the Hanford N Reactor.** Meriwether, G.H.; Skeen, D.R.; Erickson, D.G. (UNC Nuclear Industries, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 462-463(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Efforts to implement improved operating strategies at the Hanford N Reactor required that a sophisticated core physics analysis technique be developed. The code developed had to model the complex geometry of N Reactor, incorporate the control and safety systems, account for radial and axial fuel enrichment variation, provide the necessary reactivity feedbacks, and allow for fuel burnup and xenon tracking. A three-dimensional, two-group, finite difference diffusion code, DELPHI, was developed, tested, and placed in use for this purpose. The size of the model forced the code to be developed on a Class VI computer (CRAY). The overall agreement with observable core data such as flux profiles, power maps, and core excess reactivity predictions confirm that the DELPHI code is a very reliable analytical tool for studying N Reactor core conditions for life-extending core operating strategies.

15842 **Flux flattening in a graphite-moderated core.** Burnside, R.J.; Skeen, D.R.; Finfrock, S.H.; Robinson, A.H.; Toffer, H. (UNC Nuclear Industries, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 463-464(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The N Reactor is a 4000-MW(th), graphite-moderated, pressurized water reactor operated by UNC Nuclear Industries for the US Department of Energy. A flux flattening program was instituted to lower the peak-to-average flux from 1.45 to the 1.25 to 1.30 range. The N Reactor fuel is metallic uranium with discrete enrichment for each element. Element enrichment ranges from 0.71 to 1.15 wt% ^{235}U and lengths from 15 to 26 in. Axially varying fuel element enrichments in a process tube are being used to accomplish the reduced peaking. Development of numerical methods and computer models to provide design information was key to the program's success. The program objectives are to improve operational constraints, safety margins, nuclear material production, and to homogenize fluence impacts over the graphite for the rest of the reactor's life.

15843 **Cobalt processing - flask positioner location sensing system.** Braun, P.F. (AECL, Sheridan Park, Ontario). *Transactions of the American Nuclear Society;* **53**: 520-522(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Canada deuterium uranium (CANDU) reactors offer unique opportunities for economical production of ^{60}Co in the adjuster rods used for xenon override and maximization of core output. Cobalt is effectively a by-product in CANDU reactors with the standards stainless steel adjuster rods replaced with cobalt adjuster rods. The Flask Positioner unit is a part of the cobalt adjuster element processing system (CAEPS) equipment which is used for removing irradiated cobalt adjuster elements from the reactor and safely transporting them to the irradiated fuel bay, where they are dismantled and prepared for shipment. The flask positioner equipment is similar to a crane, carries the CAEPS flask and locates it in an accurate position concentric with any adjuster site centerline. This enables the required operations for safe transfer of the irradiated adjuster element into the flask. The positioner is located above the reactivity mechanism deck. The CAEPS system has been made operational on several CANDU reactors. The location sensing system has been demonstrated to work very satisfactorily on all installations.

15844 **Modeling of drift effects in CANDU reactors.** Sami, S.M. (Univ. of Sherbrooke, Quebec). *Transactions of the American Nuclear Society;* **53**: 551-553(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the most of the Canada deuterium uranium (CANDU) reactor thermohydraulic codes, the two-phase fluid is assumed to be both homogeneous and in thermal equilibrium. However, to account for the unequal velocity effects, several slip and drift correlations are incorporated within these codes. These correlations are in many respects nonmechanistic and inadequate since they do not account for countercurrent or gravity-dominated flow effects. The model described in the paper is the most realistic approach that can be used to describe slip in a transient multipurpose code. Simplified assumptions are made such that only four differential equations must be solved in the code. They are the code continuity, momentum and energy equations for mixture, and one additional equation which describes the spatial- and temporal-dependent behavior of the velocity difference. This latter equation is an arrangement of the two-fluid model equations. The resultant equation gives a time-dependent relation between the phase velocities which are a function of the pressure gradient, phase inertias, volume fraction, the flow regime, and additional constitutive relations.

15845 **Development of a PCMI analysis code for the Fugen MOX fuel rod.** Domoto, K.; Yokouchi, Y.; Kaneko, M.; Shakudo, T. (Power Reactor and Nuclear Fuel Development Corp., 9-13 Akasaka, Minato-ku, Tokyo 107). pp 429-440 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

Fugen, a 165 MWe prototype of a heavy-water moderated, boiling light-water cooled reactor, has been in operation since March 1979. The reactor power is controlled by 49 control rods and boron concentrations in heavy water. In order to clarify PCMI phenomena and to optimise the Fugen reactor operation, the following research and development is underway: (1) in-pile tests and post-irradiation examinations for clarifying PCMI; and (2) develop-

ment of design and analysis codes, based on the above experiments. The skeleton of the computer model is reported in another paper in this meeting. The applicability of the developed model for PCMI analysis of Fugen fuel was checked by comparing calculations and instrumented irradiation data from the Halden reactor. With the aid of this analysis code, the authors hope to characterise the PCMI phenomena during various kinds of power changes, such as load-follow operation.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 15798, 15955, 15973, 15974, 15975, 15976, 15977, 15978, 15979, 15980, 15983, 15984, 15996, 16000, 16001, 16014, 16015, 16016, 16075, 16076, 16079, 16136, 16162, 16244, 16273

15846 **(CONF-860906—21) Transient bowing of core assemblies in advanced liquid metal fast reactors.** Kamal, S.A.; Orechwa, Y. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 14p. NTIS MF A01; 2; GPO Dep. File Number DE87004995.

From Advances in reactor physics and safety meeting; Saratoga Springs, NY, USA (17 Sep 1986).

Two alternative core restraint concepts are considered for a conceptual design of a 900 MWth liquid metal fast reactor core with a heterogeneous layout. The two concepts, known as limited free bowing and free flowering, are evaluated based on core bowing criteria that emphasize the enhancement of inherent reactor safety. The core reactivity change during a postulated loss of flow transient is calculated in terms of the lateral displacements and displacement-reactivity-worths of the individual assemblies. The NUBOW-3D computer code is utilized to determine the assembly deformations and interassembly forces that arise when the assemblies are subjected to temperature gradients and irradiation induced creep and swelling during the reactor operation. The assembly ducts are made of the ferritic steel HT-9 and remain in the reactor core for four-years at full power condition. Whereas both restraint systems meet the bowing criteria, a properly designed limited free bowing system appears to be more advantageous than a free flowering system from the point of view of enhancing the reactor inherent safety.

15847 **(CONF-860908—38) On-line wear monitoring in liquid metal reactors.** Van Echo, A.; Keyvan, S.; King, R.W. (USDOE, Washington, DC; Technology International, Inc., Laplace, LA (USA); Argonne National Lab., Idaho Falls, ID (USA)). 1986. Contract W-31109-ENG-38;AC05-84ER80121. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004714.

From Operability of nuclear power systems in normal and adverse environments meeting; Albuquerque, NM, USA (29 Sep 1986).

Program presented here addresses the design of a Wearout Monitor (WONITOR) for application in Liquid Metal Reactors (LMRs). The WONITOR is based on adaptation of parameter identification techniques to analyze fluctuation data from measurements of parameters related to the equipments of interest. Such parameters are identified as flow rate measurements, temperature, and pressure. Considering the case of EBR-II, fluctuation data from such measurements are evaluated and found adequate for providing information on the state of the selected equipment. No additional instrumentation or sensors seemed to be necessary for the information required for implementation of the WONITOR. The present development of the WONITOR design can be directly applied to other equipment in LMRs. The system can be easily adopted for light water reactors. Also, the wear monitor is suitable for wear detection of equipment operating in hostile environments or in operation environments inaccessible to humans.

15848 **(CONF-860931—9) Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements.** Pahl, R.G.; Lahm, C.E.; Villarreal, R.; Hofman, G.L.; Beck, W.N. (Argonne National Lab., Idaho Falls, ID (USA); Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 17p. NTIS MF A01; 2; GPO Dep. File Number DE87004980.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

Uranium-Plutonium-Zirconium metal fuel irradiation tests to support the ANL Integral Fast Reactor concept are discussed. Satisfactory performance has been demonstrated to 2.9 at.% peak burnup in three alloys having 0, 8, and 19 wt % plutonium. Fuel swelling measurements at low burnup in alloys to 26 wt % plutonium show that fuel deformation is primarily radial in direction. Increasing the plutonium content in the fuel diminishes the rate of fuel-cladding gap closure and axial fuel column growth. Chemical redistribution occurs by 2.1 at.% peak burnup and generally involves the inward migration of zirconium and outward migration of uranium. Fission gas release to the plenum ranges from 46% to 56% in the alloys irradiated to 2.9 at.% peak burnup. No evidence of deleterious fuel-cladding chemical or mechanical interaction was observed.

15849 **(CONF-860931—15) Fission gas retention and axial expansion of irradiated metallic fuel.** Fenske, G.R.; Emerson, J.E.; Savoie, F.E.; Johanson, E.W. (Argonne National Lab., IL (USA)). May 1986. Contract W-31109-ENG-38. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004759.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

Out-of-reactor experiments utilizing direct electrical heating and infrared heating techniques were performed on irradiated metallic fuel. The results indicate accelerated expansion can occur during thermal transients and that the accelerated expansion is driven by retained fission gases. The results also demonstrate gas retention and, hence, expansion behavior is a function of axial position within the pin.

15850 **(CONF-860931—16) Factors controlling metal fuel lifetime.** Porter, D.L.; Hofman, G.L.; Seidel, B.R.; Walters, L.C. (Argonne National Lab., Idaho Falls, ID (USA); Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004756.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The reliability of metal fuel elements is determined by a fuel burnup at which a statistically predicted number of fuel breaches would occur, the number of breaches determined by the amount of free fission gas which a particular reactor design can tolerate. The reliability is therefore measured using experimentally determined breach statistics, or by modelling fuel element behavior and those factors which contribute to cladding breach. The factors are fuel/cladding mechanical and chemical interactions, fission gas pressure, fuel phase transformations involving volume changes, and fission product effects on cladding integrity. Experimental data for EBR-II fuel elements has shown that the primary, and perhaps the only significant factor affecting metal fuel reliability, is the pressure-induced stresses caused by fission gas release. Other metal fuel/cladding systems may perform similarly.

15851 **(CONF-861211—22) The development of a cavitation free sodium pump for the breeder reactor.** Baladi, J.Y.; Nyilas, C.P. (Westinghouse Research and Development Center, Pittsburgh, PA (USA); Westinghouse Electric Corp., Cheswick, PA (USA). Electromagnetic Div.). Dec 1986. Contract W-31109-ENG-38. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004826.

From American Society of Mechanical Engineers winter meeting; Anaheim, CA, USA (7 Dec 1986).

The sodium pumps for a liquid metal fast breeder reactor must be designed for exceptionally high reliability and long life. The principal adverse factor which tends to limit the primary pump life is cavitation which becomes potentially severe under off-design flow conditions caused by the requirement of two loop operations which resulted in a large operating flow range. This problem prompted an extensive study which included experimental investigations of scaled down and full size pumps. The investigations involved visual observations, acoustic signature recordings, and physical characteristic measurements of the model and full size impellers. The blade configuration of the model was modified several times. After each modification intensive testing was conducted with feedback to established design criteria. The results obtained from

the final configuration showed excellent cavitation performance. This configuration was then machined on the full scale impeller and tested. The results confirmed acceptable performance in the entire range of operating conditions. This paper describes the test facilities erected for this study, discusses the experimental techniques employed, and presents the experimental techniques employed, and presents a sample of the experimental results.

15852 **(HEDL-SA—2939-A, pp 133-137) Decontamination process for hot leg LMFBR components.** Lutton, J.M.; Maffei, H.P.; Colburn, R.P.; Brehm, W.F.; Anantatmula, R.P.; Bechtold, R.A.; Hall, M.B.; Steele, O.P.; Hill, E.F. May 1983. NTIS. (CONF-840411—). Contract AC06-76FF02170.

From 3. meeting on liquid metal in energy applications; Oxford, UK (9 Apr 1984).

Bench scale tests showed the glycolic-citric acid process to produce acceptable metal removal rates on cast and wrought austenitic stainless steels, provided the dissolved oxygen content of the solution was maintained at < 10 parts per billion. Diffusion studies showed nuclide penetration greatest in CF-8 (304 cast) followed by 304 wrought, CF-8M, and 316 wrought, however the same decontamination treatment applied to the four steels simultaneously showed the metal removal to be greatest in CF-8 and smallest in 316, in the same order. (In other words, the material showing the greatest nuclide penetration had the highest removal rate in the decontamination solution). Feature tests showed the process to be easily integrated with the water vapor nitrogen sodium removal process. Process control, including methods for sampling, for producing and measuring < 10 ppb dissolved oxygen, and for terminating the process - was achieved without difficulty. A 14 day treatment at 90°C effectively decontaminated all materials. Longer treatments did not improve the decontamination effectiveness and damaged one of the heats of 316 stainless steel. Colmonoy bearing materials were severely damaged by the treatment; Stellite bearing materials were unaffected.

15853 **(HEDL-SA—3336-FP) Performance of liquid metal reactor fuel pins with D9 cladding.** Makenas, B.J.; Hales, J.W. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1985. Contract AC06-76FF02170. 6p. (CONF-851115—52). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005456.

From American Nuclear Society winter meeting; San Francisco, CA, USA (10 Nov 1985).

The use of 316 stainless steel (SS) for Liquid Metal Fast Reactor applications is limited because of its tendency to swell significantly under neutron irradiation. Consequently, a number of alloys have been proposed as advanced cladding materials including precipitation hardened alloys, ferritic materials, and titanium modified versions of austenitic 316 SS. One of the latter type of alloys is called and is similar in composition to 316 SS but with titanium additions of ~0.25%. Three mixed-oxide $(U,Pu)O_2$ fuel tests containing D9-clad pins have been successfully irradiated in EBR-II. They have demonstrated significantly lower swelling for D9 than for the reference 316 SS cladding and have shown that the behavior of D9 is very similar to 316 SS with respect to other properties important to reactor design. In two of the tests (designated P43 and P44), D9 was irradiated side-by-side with various other cladding materials. Two different variations of D9 (differing primarily in molybdenum), two cladding cold work levels, and two fuel smeared densities (85% and 89% TD) were explored. The third test, P45, was made up exclusively of 20% CW D9-clad pins.

15854 **(HEDL-SA—3475-FP) SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance.** Baker, R.B.; Wilson, D.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1986. Contract AC06-76FF02170. 12p. (CONF-860931—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004346.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The SIEX3 computer program was developed to calculate the fuel and cladding performance of oxide fuel and oxide blanket pins irradiated in the fast neutron environment of a liquid metal cooled reactor. The code is uniquely designed to be accurate yet quick running and use a minimum of computer core storage. This was accomplished through the correlation of physically based models to very large data bases of irradiation test results. Data from over 200 fuel pins and over 800 transverse fuel microscopy samples were used in the calibrations.

15855 **(HEDL-SA—3484-FP) Design limits for HT9 cladding using stress-induced aging data.** Fox, G.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1986. Contract AC06-76FF02170. 7p. (CONF-860931—8). NTIS, PC A02/MF A01; GPO Dep. File Number DE87004348.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

Stress-temperature design guidelines are developed for the ferritic/martensitic cladding material HT9. High temperature operation for HT9 may cause microstructural changes/aging which softens the structure and causes increased creep rates. Higher creep strains means cladding breech becomes more probable before the end of the expected pin lifetime. Tertiary creep is considered an indication of microstructural changes and is to be avoided in fuel pin operation. The creep rate correlation, which includes tertiary creep, is examined for information on stress-temperature relationships which promote aging. This approach leads to design limits for HT9 which are compared with expected hot channel conditions for fuel pins in the Core Demonstration Experiment (CDE) planned for FFTF. The results show aging should not be significant for CDE.

15856 **(INIS-mf—10560) Advances in sodium technology, testing and diagnostics of fast reactors.** Sulc, V. (ed.). (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1984. 286p. (In Czech and Russian). NTIS (US Sales Only), PC A13/MF A01. File Number DE87700741.

Selected papers from three international specialists' meetings held in April 1983, September 1982 and April 1977.

The collection contains a selection of 29 papers from three international specialists' meetings: the CMEA conference "Control and measuring instruments and diagnostic systems of fast reactors" held in the GDR in April 1983; the IAEA conference on nuclear power experience held in Austria in September 1982; and the conference "Problems of technology and corrosion in sodium coolant and protective gas" held in the GDR in April 1977. Three papers on operating experience with Soviet fast reactors and their safety have a general character; they are followed up by three papers on sodium technology. Five papers deal with the diagnostics of fast sodium cooled reactors and nine papers are devoted to the diagnostics of steam generators. Eight papers relate to detectors for the diagnostics of fast reactors. Safety regulations for work with alkali metals are added. (A.K.).

15857 **(WAPD-TM—1548) In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program).** Clayton, J.C. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Jan 1987. Contract AC11-76PN00014. 59p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005621.

The out-of-pile corrosion behavior of ThO_2 and ThO_2-UO_2 fuel pellets was studied in high temperature, flowing, oxygenated water. Weight changes of the specimens were determined periodically during the corrosions exposures, some of which were as long as 265 days; in addition, ceramographic examinations were carried out on selected specimens. Both ThO_2 and homogeneous ThO_2-UO_2 (2 to 30 wt % UO_2) fuel showed excellent corrosion resistance, the former intrinsically because it cannot be oxidized and the latter because oxidation creates a mechanically stable surface phase. These out-of-pile results predicted favorable corrosion stability in defected irradiated fuel elements. The maintenance of ThO_2 and ThO_2-UO_2 fuel integrity in defected fuel rods was confirmed by an irradiation test program. Both the in-pile and out-of-pile test results support the conclusion that LWBR-type fuel rods containing ThO_2 and ThO_2-UO_2 pellets can successfully operate in the defect condition with limited radioactivity release to the coolant.

15858 Monte Carlo narrow resonance calculational techniques for treating double-heterogeneity effects. Gelbard, E.M.; Chen, I.J. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 245-246(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Reliable methods already exist for computing resonance intergrals (RIs) in regular lattices. But lattice structures always contain irregularities; e.g., in liquid-metal fast breeder reactor hexagonal steel walls (wrappers) surrounding subassemblies, and adjacent zones with excess sodium. Such effects have been called double-heterogeneity effects. A method has recently been proposed for computing double-heterogeneity effects on RIs. This method (method 1) uses group-averaged cross sections to get collision probabilities from a (cylindricized) sodium-wrapper region to the various (cylindricized) rings of pins, and thus involves very nontrivial approximations. Method 1 is based on the NR (or IR) approximation. The authors develop a diagnostic Monte Carlo method (method 2) which retains the NR-IR approximation, but treats cross-section variations and geometry in great detail. The NR-IR approximations also cause errors but (a) a full ring-by-ring Monte Carlo RI calculation would be very expensive, and (b) separation of errors into NR-IR errors and errors of other types may prove useful for diagnostics. After describing method 2, the authors illustrate its use by testing the method 1 calculations of a reference problem.

15859 Validation of an intermediate heat exchanger model for real-time analysis. Tzanos, C.P. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 255-257(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In earlier work, a new method was presented for liquid-metal fast breeder reactor intermediate heat exchanger (IHX) analysis in real time for purposes of continuous on-line data validation, plant state verification, and fault identification. For validation of this methodology, the Experimental Breeder Reactor-II (EBR-II) IHX transient during Test 8A was analyzed. This paper presents the results of this analysis.

15860 Complete sodium removal from equipment. Huebner, M.F.; Abrams, C.S. (Argonne National Lab.-West, Idaho Falls, ID). *Transactions of the American Nuclear Society;* **53**: 404(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Proving that metallic sodium could be successfully removed from the complex internal and external geometries of equipment (such as breeder reactor components) was one goal of the US Department of Energy's (DOE's) Sodium Waste Technology Program. A pilot-plant facility was designed and built for sodium removal at the Argonne National Laboratory-West (ANL-W) site. The pilot plant is called the Sodium Process Demonstration (SPD) Facility. It uses a combination of melt-drain-evaporate-calcine (MEDEC) processes to remove metallic sodium from large (up to 1.4-m-diam x 2.2-m-long) nonradioactive-sodium-bearing equipment. The sodium-free equipment can then be reused or disposed of using normal waste disposal methods. The sodium can be converted to storable sodium monoxide or disposed of by other means. Evaluating the effectiveness of this MEDEC process was the object of a methodical test program. After this test program proved successful, the MEDEC process was used on a production scale to remove metallic sodium from a variety of sodium-bearing items as described.

15861 Reactivity worth of gas expansion modules (GEMs) in the fast flux test facility. Campbell, L.R.; Nelson, J.V.; Burke, T.M.; Rawlins, J.A.; Daughtry, J.W.; Bennett, R.A. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 457-458(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A new passive shutdown device called a gas expansion module (GEM) has been developed at Hanford Engineering Development Laboratory to insert negative reactivity during a primary system loss of flow in a liquid-metal reactor (LMR). A GEM is a hollow removable core component which is sealed at the top and open at the bottom. An argon gas bubble trapped inside the assembly expands when core inlet pressure decreases (caused by a flow reduction) and expels sodium from the assembly. The GEMs are designed so that the level of the liquid-sodium primary system coolant within a GEM is above the top of the core when the primary pumps are operating at full flow and is below the bottom of the core when the primary pumps are off. When a GEM is placed at the boundary of the core and radial reflector, the drop in sodium level increases core neutron leakage and inserts negative reactivity. The results of these measurements confirm the effectiveness of GEMs in adding negative reactivity in loss-of-flow situations. It follows, therefore, that the inherent safety of LMRs, comparable in size to the FFTF, can be enhanced by the use of GEMs.

15862 Physics considerations in the design of long-life cores. Orechwa, Y. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 458-459(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This study quantifies the neutronic requirements for a long life core design. These requirements center about the achievement of a high internal conversion ratio. This especially in the case of oxide fuel, requires extremely aggressive designs, both from the high fuel volume fraction requirement and the demands on materials behavior under the high fast fluences.

15863 Delineations of power and power-to-flow feedback components of EBR-II. Meneghetti, D.; Kucera, D.A. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 459-460(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The detailed contributions of feedback components by regions for various experimental breeder reactor-II (EBR-II) configurations have been reported assuming given values for the coolant flows. The separation of these components into power dependent and power-to-flow dependent parts if reported here for EBR-II run 93A. The power-reactivity-decrement (PRD) can then be expressed as the sum of parts which enables the PRD for other values of coolant flow to be estimated. The delineations of the components also enhance the understanding of the contributions of the various components and regions in the feedback process in EBR-II. Separation of the components into power and power-to-flow delineations were made by calculations of the components of the PRD assuming infinite coolant flow and comparing with results previously reported for finite flow. Subtractions of the infinite-flow feedback values from the corresponding finite-flow values give the power-to-flow portions. These linear and Doppler components of the PRDs were calculated using the EBRPOCO program together with an addition to the program (RODCO) which accounts for the effects of axial positionings of control rods.

15864 Qualification of an LWBR-irradiated fuel assay gauge. Tessler, G.; Beaudoin, B.R.; Beggs, W.J.; Freeman, L.B.; Goldberg, I.; Hecker, H.C.; Kahler, A.C.; Schick, W.C. Jr.; Simon, C.J.; Raab, H.F. (Bettis Atomic Power Lab.). *Transactions of the American Nuclear Society;* **53**: 464(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A production-irradiated fuel assay gauge (PIFAG) has been developed with the capability of determine, nondestructively, the total fissile fuel content (loading) of an irradiated fuel rod with a precision of 0.5% or better. This gauge was developed by the Bettis Atomic Power Laboratory under the technical direction of the US Department of Energy's Office of Naval Reactors to be used for proving breeding in the light water breeder reactor (LWBR). This paper presents nondestructive and destructive data that demonstrate the high precision, accuracy, and stability of the PIFAG. The PIFAG is being qualified by comparison of PIFAG results with destructive assay results for 17 rods, repeated assay at long time intervals of a selected number of rods of each type, and

continuous monitoring with a normalization rod. These data demonstrate that the PIFAG meets the precision objectives of the fissile loading determination.

15865 **Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime.** Betten, P.R. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 532-533(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A time-temperature history of in-core thermocouples has been kept for an instrumented subassembly irradiated in the Experimental Breeder Reactor-II (EBR-II). This paper presents some of the data which indicate that (a) the radial coolant temperatures tend to flatten out with irradiation, (b) this flattening is gradual, with time, after a short incubation period, and (c) these changes are caused by element bowing and redistribution.

15866 **The U.S. fast reactor materials and structures program.** Harms, W.O.; Purdy, C.M. (Oak Ridge National Lab., Oak Ridge, TN 37831). pp 145-154 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—). Contract AC05-84OR21400.

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

The U.S. Department of Energy has sponsored a vigorous breeder reactor materials and structures program for about 15 years. Important contributions to breeder development have resulted from this effort in the areas of design (inelastic rules, verified methods, seismic criteria, mechanical properties data); resolution of licensing issues (technical witnessing, confirmatory testing); construction (fabrication/welding procedures, nondestructive testing techniques); and operation (sodium purification, instrumentation and chemical analysis, radioactivity control, and in-service inspection). The national LMFBR program currently is being restructured to address base technology needs for innovative designs that are economically competitive and demonstrably safe. It is anticipated that in support of this activity the Materials and Structures Program will focus its efforts in the following areas: (1) removal of anticipated licensing impediments through confirmation of the adequacy of structural design methods and criteria for components containing welds and geometric discontinuities, the generation of mechanical properties for stainless steel castings and weldments, and the evaluation of irradiation effects; (2) qualification of modified 9 Cr- 1 Mo steel and tribological coatings for design flexibility; (3) development of improved inelastic design guidelines and procedures; (4) reform of design codes and standards and engineering practices, leading to simpler, less conservative rules and to simplified design analysis methods; and (5) incorporation of information from foreign programs through exchange and collaboration.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

15867 **(ORNL/TM—10267) Assessment of ceramic composites for multimegawatt space nuclear power systems.** Besmann, T.M. (Oak Ridge National Lab., TN (USA)). Dec 1986. Contract AC05-84OR21400. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005272.

A calculational thermodynamic equilibrium analysis of the compatibility of ceramic-ceramic composites and a nonequilibrium assessment based on the literature of their use in proposed multimegawatt space nuclear power systems was performed. The five candidate composites included Al_2O_3-reinforced Al_2O_3, SiC-whisker-toughened Al_2O_3, SiC-whisker-toughened Si_3N_4, SiC-fiber-reinforced ZrC, and carbon-fiber-reinforced ZrC. The reactor concepts included Brayton cycle (continuous and burst mode) and Rankine cycle. It was determined that Al_2O_3-reinforced Al_2O_3 and carbon-fiber-reinforced ZrC are compatible in the Brayton-cycle continuous-mode system and that Al_2O_3-reinforced Al_2O_3, SiC-fiber-reinforced ZrC, and carbon-fiber-reinforced ZrC are compatible in the Rankine-cycle system. None of the candidate ceramic composite systems was likely to be sufficiently stable under Brayton-cycle burst-mode conditions.

15868 **Fuel system and structural alloy considerations for space nuclear reactor systems.** Hoffman, E.E.; Cooper, R.H. Jr. (US Dept. of Energy, Oak Ridge, TN 37831). pp 157-161 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—). Contract AC05-84OR21400.

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Sufficient data exist to provide a high level of confidence that refractory-alloy-clad ceramic fuel pins and refractory structural alloys can be used successfully in an operational space power system. However, data are not yet sufficient to ensure that these materials can meet the temperature, lifetime, and system mass envelope requirements for reliable operation of a 100 kW(e) system as specified by the SP-100 Project. Development efforts to provide these data are being initiated.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 15573

2108 Economics

REFER ALSO TO CITATION(S) 15406, 15801, 15839, 16071, 16109, 16131, 16176, 16177, 16178, 16179, 16180

15869 **(CONF-861185—3) Effect of changes in DOE pricing policies for enrichment and reprocessing on research reactor fuel cycle costs.** Matos, J.E.; Freese, K.E. (Argonne National Lab., IL (USA)). 3 Nov 1986. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004685.

From Reduced Enrichment for Research and Test Reactors (RERTR) program international meeting; Gatlinburg, TN, USA (3 Nov 1986).

Fuel cycle costs with HEU and LEU fuels for the IAEA generic 10 MW reactor are updated to reflect the change in DOE pricing policy for enrichment services as of October 1985 and the published charges for LEU reprocessing services as of February 1986. The net effects are essentially no change in HEU fuel cycle costs and a reduction of about 8 to 10% in the fuel cycle costs for LEU silicide fuel.

15870 **(IAE—4072/3) Nuclear power safety economics.** Legasov, V.A.; Demin, V.F.; Shevelev, Ya.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. 48p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700703.

The existing conceptual and methodical basis for the decision-making process insuring safety of the nuclear power and other (industrial and non-industrial) human activities is critically analyzed. Necessity of development a generalized economic safety analysis method (GESAM) is shown. Its purpose is justifying safety measures. Problems of GESAM development are considered including the problem of costing human risk. A number of suggestions on solving them are given. Using the discounting procedure in the assessment of risk or detriment caused by harmful impact on human health is substantiated. Examples of analyzing some safety systems in the nuclear power and other spheres of human activity are given. 48 refs.; 7 figs.; 2 tabs.

15871 **(IAEA-TECDOC—376) Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA.** (International Atomic Energy Agency, Vienna (Austria)). May 1986. 103p. (CONF-8509366—). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889.

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

This report is intended for designers and planners concerned with Small and Medium Power Reactors. It provides a record of the presentations during the meetings held on this subject at the Agency's General Conference in September 1985. This information should be useful as it indicates the principal findings and main conclusions and recommendations resulting from these meetings. A separate abstract was prepared for each of the 10 presentations in this report.

15872 (IAEA-TECDOC—376, pp 15-29) **Economic case for small and medium power reactors in India.** Srinivasan, M.R. (Department of Atomic Energy, Bombay, India). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

The Indian case of the use of small and medium sized power reactors is described in this paper in conjunction with the Indian nuclear power programme and in terms of operational experience, standardization of designs, choice of unit size, industrial infrastructure, and economic aspects. Figures and graphs show the Indian nuclear programme up to year 2000 A.D., the performance of Indian nuclear power stations, safety provisions in Indian PHWR design, sizewise distribution of power plants in India, growth of manufacturing capability for components, manufacturing cycle time of nuclear reactor components, break-up of expenditures for the 10,000 MW nuclear power programme, nuclear power investment costs in India, cost structure of Indian nuclear stations, cost of generation from nuclear and thermal stations in operation, and total fuel cycle investment costs. 14 figs.

15873 (IAEA-TECDOC—376, pp 31-43) **Experience with Atucha I Nuclear Power Plant, both as regards technology transfer arrangements and operational experience.** Quihillalt, O.J. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina. Cost and Planning Div.). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

This paper describes in a stepwise fashion according to the different stages of the Atucha Nuclear Power Plant project the experience and transfer of technology obtained by Argentina and Comision Nacional de Energia Atomica (CNEA) in connection with the construction of the power plant. The following is described briefly: Planning, requests for offers, evaluation of proposals, contract award, participation of national industry, participation of CNEA's personnel, training of operating personnel, development of the project, commissioning, take-over, plant operation, analysis of the performance (number of outage, load factor, availability factor, fuel burning, heavy water leakage, production costs), and the client-supplier relation. An annex contains representative technical data on the Atucha I reactor.

15874 (IAEA-TECDOC—376, pp 45-49) **Background for and experience with Qinshan project in China.** Ouyang Yu. (Shanghai Nuclear Engineering R and D Inst., China). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

Qinshan Nuclear Power Plant is now under construction. It is expected to be commissioned in 1989. The construction of this NPP is an important part of China's nuclear power development plan. This paper describes briefly the following: 1. The need for developing nuclear power in China and its favorable condition for this development. 2. Research and development works for the 300 MW(e) Qinshan nuclear power project. 3. Design and construction of the power plant. 4. Organization and manpower preparation. 5. Significance of the construction of the Qinshan NPP (PWR type reactor). The advantages of using SMPRs (Small and Medium Power Reactors) in China are mentioned finally.

15875 (IAEA-TECDOC—376, pp 59-67) **Electric Power Research Institute (EPRI) study on small and medium power reactor concepts having present potential for the USA.** Braun, C. (Eiectric Power Research Inst., Palo Alto, CA, USA). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

This paper focuses on the EPRI small light water reactor programme (which is a part of a more general programme of advanced light water reactors study of both large and small). The reasons why American utilities are interested in small reactors are stated. The issue of cost is mentioned as the major problem confronting nuclear power plants in the USA today. The major problem in controlling the base cost is considered to be the increase in labour charges rather than materials. It is hoped that through the design of simplified and standardized plants it will be possible to cut down the costs. There is also a need for modular construction and shop-fabrication. With this need in view, the general objective of the smaller reactor programme that we have embarked on at EPRI is to provide a reactor plant of 400-600 MW design or at least the conceptual design of such a plant. Actually the first part of the programme is only pre-conceptual design with the general groundrule that the plants' total generation costs should be equal to coal generation costs in the United States. The capital costs of the small LWRs should not be higher than the capital costs of the current large nuclear power plants. The programme is made up of two phases. The first phase of the programme in now under way and that includes the selection of three design teams made up of most of the vendors and architect engineering companies in the United States to do a pre-pre-conceptual design of a plant that will cut the capital cost and try to provide us the objectives that we have listed above. Then there is going to be a second phase in which one or two of the better designs that come out during the first phase will be further carried out to a full conceptual design. 3 figs, 6 charts.

15876 (IAEA-TECDOC—376, pp 77-78) **Presentation of the purpose of the meeting.** Char, N.L. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Power). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

The situation of SMPRs now shows a complete reversal of the situation which prevailed a decade ago when potential SMPR buyers were relatively numerous but suppliers showed little interest to produce a new power plant design. There is now an increasing interest for SMPRs on the supplier side but that buyer countries hesitate to take a decision probably both because they are aware of the problems linked with the introduction of nuclear power and because they want assurance of the economics of a project before launching it. That assurance is only possible to achieve in more country-specific studies. That is why the Agency decided to hold this meeting directed to prospective buyers in order to provide them with an opportunity to be informed about the results of the first phase of the SMPR Project Initiation Study and to define better the specific constraints which they see to exist in the introduction of SMPRs in developing countries and consider the possible ways and means of removing those constraints.

15877 (IAEA-TECDOC—376, pp 79-85) **Presentation of main results of Phase I of the SMPR project initiation study.** Wald, F. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Power). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

As a result of a first Technical Committee Meeting held in Vienna in August 1983 the IAEA launched a new SMPR Project Initiation Study with the objective of surveying the available designs, examining the major factors influencing the decision-making processes in developing countries and thereby also arriving at an estimate of the potential market. The Nuclear Energy Agency of OECD offered its assistance in making a study of the potential market in industrialized countries. Two questionnaires were used to

obtain information from potential suppliers and buyers. Suppliers responded with an overwhelming 23 design concepts which could be offered for export but with varying levels of readiness and provenness. From potential buyers 17 responses were received, 16 of which were from the developing countries. The analysis of the responses which was done by the Agency with the help of experts from Member States gave the basis for a draft report including the OECD/NEA part. This draft was discussed during a second Technical Committee Meeting held in Vienna in March 1985. The meeting was characterized by a strong supplier interest but also by hesitation of potential buyers to make any kind of commitments relating to the market introduction of SMPRs. All new information has been incorporated into the report together with a number of expressed comments, especially related to the presentation of the economics of SMPRs, the necessity of a reference plant, provenness of major components and systems etc. The results of the study are presented here with direct reference to the SMPR supply situation and the potential market for SMPRs in terms of the decision-making factors: the financial factors, the economical factors, and the technological factors were identified as the most important ones. The economic competitiveness is not the only decision-making factor and consequently it was decided to end the general study called Phase I by the publication of a report.

15878 (IAEA-TECDOC—376, pp 87-96) **Presentation of the results of the seminar on cost and financing of nuclear power programmes in developing countries.** Bennett, L.L. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Power). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

The Agency organized a Seminar on Costs and Financing of Nuclear Power Programmes in Developing Countries, in Vienna during 9-12 September 1985. The seminar dealt with three main topics: 1. Nuclear investment and fuel cycle costs; 2. Financial risk assessment at project and country levels; 3. Loan conditions. The primary objective of the seminar was to promote a dialogue among the various parties involved in the domain of nuclear power financing, i.e., buyers, suppliers and financing organizations. The keen interest in this topic was demonstrated by the participation of some eighty delegates from twenty-nine Member States (eighteen of them developing countries) and seven international organizations. Many financing organizations were represented in the seminar. The Agency presented information from its own studies as well as results from studies by other international organizations. In spite of their proven overall economic competitiveness, the high capital requirements for nuclear power plants pose difficult financing problems and financing remains a major constraint on nuclear power programmes in developing countries. Some mechanisms that could be used in conjunction with the traditional financing approach were proposed as measures to improve the present situation. The catalytic role that the IAEA could play in order to establish new working relationships on the part of potential buyer countries, suppliers and lending organizations was strongly emphasized. It was recommended that the Agency develop and strengthen its contacts with commercial lenders and with export-credit agencies, in order to enlarge its role to assist in developing new financing concepts better adapted to the nuclear domain. A status of nuclear power programmes in developing member states is included. 1 tab.

15879 (IAEA-TECDOC—376, pp 97-98) **Analysis of the invited countries questionnaire responses.** Wald, F. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Power). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

15880 (IAEA-TECDOC—376, pp 99-100) **Interregional technical co-operation project on small and medium power reactors.** Montes Ponce de Leone, J. (International Atomic Energy Agency, Vienna, Austria. Div. of Technical Assistance and Co-operation). May 1986. NTIS (US Sales Only), PC A06/MF A01. File Number DE87700889. (CONF-8509366—).

From IAEA general conference on small and medium power reactors; Vienna, Austria (25 Sep 1985).

15881 (IAEA-TECDOC—378) **Costs and financing of nuclear power programmes in developing countries. Proceedings of a seminar held in Vienna, 9-12 September 1985.** (International Atomic Energy Agency, Vienna (Austria)). Jul 1986. 331p. (CONF-850931—). NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707.

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This seminar organized by the IAEA dealt with three main topics: 1) Nuclear investment and fuel cycle costs. 2) Financial risk assessment at project and country levels. 3) Loan conditions. Its main objective was to promote a dialogue among the various parties involved. As it focuses on nuclear and electric power programmes in developing countries a status of this topic is given in the introduction.

15882 (IAEA-TECDOC—378, pp 15-56) **Status of and perspectives and constraints for nuclear power in developing countries.** Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This status of the perspectives and constraints for nuclear power in developing countries deals with the following topics: 1) The energy situation in developing countries. 2) Conditions for introduction of nuclear power in developing countries. 3) Competitive situation of nuclear power in developing countries. 4) Technical and economic provenness of nuclear power. 5) Economic viability of nuclear power. In addition hereto it contains the following appendices: a) economic performance outlook of nuclear power plants (in Belgium, Canada, France, India, Japan); b) Payback time for nuclear power plants relative to coal plants; c) Simplified example of loan analysis. 8 refs, 11 figs and tabs.

15883 (IAEA-TECDOC—378, pp 57-58) **Presentation of the SMPR study.** Wald, F. (International Atomic Energy Agency, Vienna, Austria. Div. of Nuclear Power). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The first phase of the Small and Medium Power Reactor Study (the SMPR Study) has been completed. The study has led to the collection of brief descriptions of 23 designs of SMPRs, covering the whole range and at different stages of development. It has helped shed light on several factors, the most important of which are as follows: 1) financing difficulties; 2) the economics of SMPRs in comparison with the other options; 3) infrastructure requirements in industry and with respect to manpower.

15884 (IAEA-TECDOC—378, pp 59-72) **Financing electric power in developing countries.** Heron, A. (World Bank, Washington DC, USA. Energy Dept.). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The paper discusses the future growth of electricity demand, the likely changes in power investment patterns, and the global investment requirements during the 10 year period 1986-1995 for power generation, transmission, and distribution. The investment during the period is analysed as between foreign and local currency requirements, the likely principal sources of finance, the problems which are experienced in financing power investment, and the origin of those problems. The paper provides details of the origin,

nature and finances of the World Bank Group, reviews its past lending operations and some of the broader aspects of its lending operations.

15885 (IAEA-TECDOC—378, pp 103-104) **Nuclear power costs in developing countries.** Meyer, P.J. (Kraftwerk Union A.G., Erlangen, Germany, F.R.). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Talking about costs for nuclear power plants a lot of parameters have to be analysed influencing the costs, such as the size of the nuclear program and the plant capacity of each unit. Regarding experience in several cases of export orders with a high content of national participation, the cost for a nuclear power plant became much higher than previously calculated because of several cost influencing factors, which are mentioned in the paper. A further aspect influencing the development is the extensive technology transfer program, which may have to be established within the frame of a complete nuclear program.

15886 (IAEA-TECDOC—378, pp 105-116) **Indian experience in investment cost in Small Size Nuclear Power Reactor Units.** Parthasarathi, A.R. (Department of Atomic Energy, Bombay, India). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This paper describes the Indian situation and experience in relation to the investment in Small Size Nuclear Power Reactor Units. Data are given on nuclear power investment costs. The characteristics of the Indian experience are also given in detail. Nuclear power generation costs and pricing are discussed. Important parameters used for calculating unit energy cost from nuclear power plants are listed. Nuclear and thermal power costs are compared. The variation of unit energy cost with change in various parameters is explained. 4 tabs.

15887 (IAEA-TECDOC—378, pp 117-121) **Economic efficiency of nuclear power in the People's Republic of China.** Luo Anren; Yang Xianshu. (Office of Nuclear Power Steering Committee, State Council, Beijing, China). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

In the majority of cases the construction cost of a nuclear power station is higher than that of a coal fired power station of the same output, while its generation cost is lower. As a whole, the economic efficiency of the nuclear power is higher than that of coal power. In China however, the situation is somewhat different. This paper explains why in China one has to take into account special factors. The economic parameters used for calculating the generation cost are listed. A comparison of generation costs in China for nuclear power stations and coal-fired power stations, respectively, is made. 1 tab.

15888 (IAEA-TECDOC—378, pp 123-129) **Factors influencing capital costs of nuclear power plant in Finnish conditions.** Vuorinen, A. (IVO Consulting Engineers Ltd, Helsinki, Finland). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This paper is based on the experience gained in construction and operation of nuclear power plants in Finland. It discusses the various factors influencing the capital costs of nuclear power plants in the Finnish context. It deals with such topics as: 1. Basic plant design features; 2. Main supplier's and owner's involvement; 3. Productivity of implementation; 4. Government influence (taxation policy and energy policy); 5. Experience of the organizations. Tables are given on the factors influencing the costs and the nuclear power costs in Europe. 1 ref, 2 tabs.

15889 (IAEA-TECDOC—378, pp 131-151) **Economic aspects of implementing a SMPR project. A case study for Bangladesh.** Hossain, A.; Karim, C.S. (Bangladesh Atomic Energy Commission, Dhaka). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

In this paper it is shown that introduction of nuclear power in Bangladesh is a necessity of the country, has to pursue its goals of attaining desired growth of economy and meet the electricity requirements of the future. The efforts to implement a nuclear power project has suffered so far due to lack of necessary financing, the energy situation of the country and the projected growth of electricity. The indigenous energy resources are listed. Figures on the growth in energy consumption in Bangladesh and other countries are given in a couple of tables. The dedication of gas to different sectors is described. The availability of reactors of suitable size is also described as well as the cost economics involved. The financing sources are considered. 23 refs, 1 map, 7 tabs.

15890 (IAEA-TECDOC—378, pp 157-163) **Sharing of benefits and risks in regard to the establishment of nuclear power programmes in developing countries.** Darroch, I.D. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario. CANDU Operations). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The establishment of a nuclear power program in a developing country is dependent upon the needs of a number of different parties being satisfied. One key area in this regard is the structuring of a reasonable and equitable sharing of both risks and benefits. This paper is intended to provide an overview and introduction to this topic. The points to be addressed here are: the key players involved; the relationships between the players; the benefits of a nuclear power program; the sharing of benefit; the risks involved; the sharing of risks through appropriate business arrangements; some possible arrangements. Many business arrangements are possible, however the most appropriate arrangement for a specific project must take into account the needs, desires and priorities of the specific developing country whilst providing acceptable incentives and compensation to the suppliers and to the financiers. This paper does not attempt to reach a conclusion that would be applicable in each and every case, but it is intended to point out that this is a very complex area requiring a great deal of creativity and innovation in order to establish an appropriate arrangement for each case.

15891 (IAEA-TECDOC—378, pp 177-200) **Financial problems of nuclear programmes. The experience of Argentina.** Terigi, R. (Comision Nacional de Energia Atomica, Buenos Aires, Argentina). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The experience of Argentina in planning nuclear power is expressed here in terms of technological, economic, financial, and political factors. The integration of nuclear energy, the inflationary context and the state participation in the electricity subsector are described. The risk factors are analyzed. The results achieved are listed. The new institutional situation is outlined. The role of international relations in relation to the above mentioned situation is discussed and the underlying determining factors are mentioned.

15892 (IAEA-TECDOC—378, pp 201-203) **Retrospective economic and financial analysis of the Laguna Verde Project.** Tapia Garcia, F.; Gomez Mariles, A.; Morales Galvan Duque, L. (Comision Federal de Electricidad, Mexico City). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The objective of this paper is to show, from an economic and financial point of view, the effects of the capital expenditure

programme of the Laguna Verde Nuclear Power Plant Project on costs in terms of investment per kWh generated. An economic and a financial analysis are therefore included. Various investment periods and balanced costs are considered.

15893 (IAEA-TECDOC—378, pp 205-211) **Risk assessment from point of view of supplier.** Meyer, P.J. (Kraftwerk Union A.G., Erlangen, Germany, F.R.). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

According to this paper the risks associated with a nuclear power plant project from the point of view of the supplier can be seen mainly in the following fields: Contractual risks, technical risks, and financial risks. In this paper some points are discussed to identify the areas in which risks are expected. The paper only touches briefly on the assessment of risks from the point of view of the supplier. However, a schematic diagram of the risk assessment from the point of view of the supplier is included.

15894 (IAEA-TECDOC—378, pp 213-221) **Nuclear project finance in developing countries: The multi-country financing alternative.** Fleck, J.B. (Westinghouse Nuclear International, Brussels, Belgium). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

It is the basic contention of this paper that, because of certain factors in the financial markets, multi-country financing (MCF) is the new alternative if not the imperative for large scale and turnkey nuclear plant programs in developing countries. The point is made that its successful use depends on the ability of the host country, the credit granting countries and suppliers to both recognize the MCF reality and manage its implicit variables. Those who collectively do so will be successful, and those who cannot will not be states the author. The aspects of MCF are described.

15895 (IAEA-TECDOC—378, pp 223-227) **Sales of nuclear power stations to developing countries: Risk assessment for export credit insurance.** Ward, D.A. (Berne Union, London, UK). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

In this statement on how the export credit insurer sets about making a risk assessment begins with an explanation of what his function is and what are the risks he needs to assess. The risks covered by export credit insurers are usually considered under two heads, the commercial, related to the individual related to the individual buyer, and the political, related to the buyer's country. The emphasis with any big project is much more on the political i.e. country risk. The country risk assessment is therefore described in more detail. The author concludes that such assessments are difficult to make in particular for nuclear projects owing to the very long time span.

15896 (IAEA-TECDOC—378, pp 229-234) **Country risk evaluation by the supplier.** Lehmann, M. (Framatome, Paris La Defense, France). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Two preliminary facts are underlined in this paper: There is no agreement on the time horizon to be considered in forecasting and planning, and there is always a gap between risks as perceived and real risks. Four possible time horizons are considered (in some detail) and compared. The conclusion is that one should concurrently consider all the time horizons discussed. Risk analysis should be studied as a "continuum". The example of Mexico is mentioned in this connection. Typical risks are listed. Methods by which these risks can be evaluated are described: Two broad conventional and two new methods. The existing methods are regarded as satisfactory but their limits are stressed.

15897 (IAEA-TECDOC—378, pp 241-244) **Nuclear power plants and project finance.** Vaissiere, P. de. (Banque Indosuez, Paris, France). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The main characteristics of project financing are mentioned as well as different types of projects to which the techniques of financing have been applied. The issues encountered in financing medium size nuclear power plants in developing countries which distinguishes it from traditional project financing are listed and commented. As it seems difficult for commercial banks to take the risks involved in such nuclear projects the paper describes an alternative solution based on the idea that the commercial obligation be substituted by a financial obligation. An example of this is to give a concession to a private company to purchase and operate the power station in question for a given period of time and sign with this company a long term electricity purchase agreement over the same period. The merits of this set up are mentioned.

15898 (IAEA-TECDOC—378, pp 245-251) **Preparation and appraisal of electric power projects.** Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

This note is for the use of Bank staff and potential borrowers, consultants and others who may be involved in the preparation of electric power projects which may be considered for financing by the Bank and IDA. It outlines the Bank's approach to the appraisal of power projects and may be used as a general guide for the content of project feasibility studies and other information which may be needed to support the project. It emphasizes that projects should be justified as part of a least-cost system and identifies the economic criteria which is usually used in project evaluation. The paper presumes general familiarity with Bank policies and procedures and with techniques of power development programming; therefore the paper is not comprehensive and is not intended to be used as an instructional guide.

15899 (IAEA-TECDOC—378, pp 253-257) **Project financing. Financial planning model (FINPLAN).** Vanhoutteghem, P. (Credit Lyonnais, Paris, France). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

The "Project Financing" approach is summarized here in terms of four phases: Establishing a gross operating surplus profile on the basis of the lifetime of the loan, on reasonably pessimistic assumptions; Discounting; Establishing the security ratio; Calculating the guarantee value of the project. However, these broad principles cannot be applied to nuclear activities without significant adaptation. The reasons for this are stated as well as other factors of relevance in the nuclear case. At the request of the Agency, CREDIT LYONNAIS has prepared a financial planning model (FINPLAN) adapted to the nuclear sector and permitting, on the basis of input of the WASP model, measurement of the probable financial consequences of investment decisions. FINPLAN and WASP are not interactive but a successive study can be made of the alternative orders of power plant construction considered by WASP to be close to the economic and physical optimum. FINPLAN takes into account both local and foreign estimated inflation rates (on which the investment sum and the operational costs will depend) as well as fluctuations in parity (foreign currency/local currency) and will automatically calculate annual profits and losses in exchange. The model cannot, however, make an exhaustive analysis of the financial criteria. It is simply an auxiliary tool for decision making.

15900 (IAEA-TECDOC—378, pp 259-261) **OECD Consensus and loan conditions on officially supported financing for nuclear power plants.** Ray, J.E. (OECD, Paris, France. Division of Financing and Other Export Questions). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Today, all OECD countries provide official export insurance coverage and all but one offer direct export financing support by way of direct credits, refinancing, or interest rate subsidisation. The proliferation of government export financing support programmes and the increasing competition among them provoked fear that an "export credit war" might develop and eventually led to the formulation of the OECD "Consensus" in July 1976 and the adoption in February 1978 of the "Arrangement on Guidelines for Officially Supported Export Credits". The "Arrangement" stipulates a number of guidelines to which participating countries pledge to adhere. The most important rules are mentioned in this paper. A Sector Understanding on Export Credits for Nuclear Power Plants which complements the Arrangement, was adopted on 31 July 1984 and made effective as of 18th August 1984. The principle constraints on credit terms are also mentioned in this paper. The above mentioned Understanding is new and still in its "breaking in" phase. Some time will be needed in order to tell how well its provisions will work in practice.

15901 (IAEA-TECDOC—378, pp 263-269) **Present situation of export credits.** Brodelle, J. (Banque Francaise du Commerce Exterieur, Paris, France). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Official support in respect of financing is being increasingly criticized and even the principle of it is questioned, with the result that in the majority of exporting countries there is a tendency towards gradual government disengagement. This paper is focused on this phenomenon. The statements contained in this paper are not limited to export credits related to nuclear power plant exports as they are of the same nature as in conventional export credits. The origins of export credits are recalled. The international agreements concluded in this field are described briefly. It is shown that the terms and conditions for government involvement in export financing have undergone profound changes. The problems of the present situation are reviewed. It is concluded that the official support for financing does not appear to be under threat and the official machinery for this cannot at the present stage be competitively replaced by the new possibilities offered by the financial markets.

15902 (IAEA-TECDOC—378, pp 271-275) **Commercial bank contribution in the financing of nuclear plant export contracts.** Stakowski, R. (Credit Lyonnais, Paris, France). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

In this paper on financing the following is mentioned briefly: The export credit loan and the provision of the complementary amount of funds. A hypothetical example of the intervention of a commercial bank in the financing of a nuclear plant export contract is given. An appendix to the paper includes examples of loan conditions involving the government of Indonesia. In another appendix a possible hybrid-loan combination is described. It is concluded, however, that in the field of financing of nuclear plant export contracts the issues can only be discussed in a qualified manner if done on a case by case basis and in the light of the hypothesis taken into account in appraising the project yield and in the light of the legal structure envisaged.

15903 (IAEA-TECDOC—378, pp 277-287) **Cost and financing of nuclear power program in Turkey.** Kutukcuoglu, A. (Turkiye Elektrik Kurumu Nukleer Enerji Dairesi, Ankara). Jul 1986. NTIS (US Sales Only), PC A15/MF A01. File Number DE87700707. (CONF-850931—).

From International seminar on costs and financing of nuclear power plants in developing countries; Vienna, Austria (9 Sep 1985).

Preparatory work for the construction of the first Nuclear Power Plant (NPP) in Turkey has been continuing since 1974-1975. Upon requirement of the Turkish Government to build and operate the NPP for 15 years through a joint-venture to be established with the participation of the Utility (Turkish Electricity Authority) and the Supplier, two slightly different management and financing schemes have been developed with AECL (Canada) and KWU (Kraftwerk Union) for this model which will be exercised for the first time in the world for a nuclear project. Some of the important aspects of these two approaches are highlighted in this paper. The first joint-venture model described consists of the construction and operation of NPP by Joint-Venture Utility. The second joint-venture model described consists of the construction and operation of NPP by Joint-Venture Management Company on behalf of the Utility. Graphical illustrations of the agreements, contracts and business structure of the two models are shown. The costs, financing and cash flow in these two cases are discussed. 6 figs, 2 tabs.

15904 **(IAEA-TECDOC—383) Introduction to cost-effectiveness analysis of risk reduction measures in energy systems.** (International Atomic Energy Agency, Vienna (Austria)). Jul 1986. 70p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87701286.

The aim of this report is to introduce readers to methods of cost-effectiveness analysis and their application in risk reduction, especially in connection with the energy-producing industries. The background to the assessment of risk and the problems in estimating it quantitatively are outlined. The methodology of cost-effectiveness analysis is then described, particular attention being given to the way in which results are derived and the overall use that can be made of them. This is followed by a discussion of quantitative applications and an outline of the methods that may be used to derive estimates both of risk and the cost of reducing it. The use of cost-effectiveness analysis is illustrated in an appendix, which gives as a worked example a case study on the reduction of public risk associated with radioactive releases during normal operation of a PWR. After drawing some general conclusions the report recommends that such analyses should normally be used as an aid to risk management whenever several alternative risk reduction measures are under consideration. 36 refs, 28 figs, 14 tabs.

15905 **Nuclear decommissioning - the financial R & R problems.** Swanson, R. *Transactions of the American Nuclear Society;* **53**: 73(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

From a financial standpoint, nuclear decommissioning issues can be synthesized into two primary concerns. The first concern is that actual decommissioning costs are recovered from users of nuclear generation. The second concern - one of reliability - is that amounts so recovered are actually available in current available funds when decommissioning occurs. These concerns, of course, are not new. They have been present from the very beginning of the civilian nuclear program. The issue of recoverability has been the subject of numerous rate proceedings of electric utilities. The one constant of these proceedings has been agreement that the customers who utilize the kilowatts generated by nuclear energy should pay the rates to provide funds for decommissioning. The ratemaking issues have been (a) what amount is necessary and (b) how that amount should be provided - i.e., on a straight-line basis or some other basis such as a sinking fund methodology. The scope of this paper insofar as recoverability is concerned is limited to the latter issue. The dollar estimates will be left to engineers.

15906 **Fuel cost impacts of using constant cycle-based amortization rates.** Venkateswaran, S.R.; Park, Y.M. (NUS Corp., Rockville, MD). *Transactions of the American Nuclear Society;* **53**: 80-81(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper is concerned with amortization of nuclear fuel to expense, and analyzes the impacts of using alternative amortization methods on the nuclear fuel cycle cost, namely, use of a constant cycle-based amortization rate and use of batch-based amortization rates. Results of this comparison are summarized.

15907 **Examination of fuel reinsertion strategies for out-of core fuel management.** Comes, S.A.; Turinsky, P.J. (North Carolina State Univ., Raleigh). *Transactions of the American Nuclear Society;* **53**: 82-84(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A computer code for determining out-of-core fuel loading strategies in order to minimize levelized fuel cycle cost within constraints has been developed and previously reported by the authors. While past work in this area has dealt with optimizations during equilibrium operating conditions, this work has considered the more realistic conditions of nonequilibrium cycles. The code, called OCEON, seeks to determine a family of economically attractive fuel reload strategies through the optimum selection of feed batch sizes, enrichments, and partially burned fuel reinsertion strategies within operating constraints. This paper presents recent work on expanding the code to allow for different fuel reinsertion options when determining the family of near-optimum fuel reload strategies.

15908 **Nuclear fuel cycle variables calculation code - FUTURE.** Fukushi, S.; Murakami, S.; Furuya, K.; Funatsu, M.; Fujioka, K.; Kamata, E. *Transactions of the American Nuclear Society;* **53**: 85-86(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The development and realization of technologies related to those facilities constituting a nuclear fuel cycle, including a nuclear power plant, require a vast investment and a long-term preparation period. Consequently, in order to promote nuclear power generation, it is inevitable that well-coordinated and conformable development strategies will be established, based on long-term prospects. To meet these demands, several calculational codes have been developed and are now being utilized in planning stages. Due to advantages in nuclear power technology in recent years, however, more precise and detailed data are now necessary, and as a result these existing codes have become inadequate. Based on this background, the FUTURE (fuel cycle for total uranium resources) code has been developed to enable a more accurate long-term analysis reactor types, determination of nuclear fuel cycle variables, and economical studies of power generation costs. The system comprises the material calculation, cost calculation, and report editing programs.

15909 **Choosing the optimum burnup.** Geller, L.; Goldstein, L.; Franks, W.A. (S.M. Stoller Corp., Boulder, CO). *Transactions of the American Nuclear Society;* **53**: 104(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper reviews some of the considerations utilities must evaluate when going to higher discharge burnups. The advantages and disadvantages of higher discharge burnups are described, as well as a consistent approach for evaluating optimum discharge burnup and its comparison to current practice. When an analysis is performed over the life of the plant, the design of the terminal cycles has significant impact on the lifetime savings from higher burnups. Designs for high burnup cycles have a greater average inventory value in the core. As one goes to higher burnup, there is a greater likelihood of discarding a larger value in unused fuel unless the terminal cycles are designed carefully. This effect can be large enough in some cases to wipe out the lifetime cost savings relative to operating with a higher discharge burnup cycle.

15910 **Effects of high burnup on spent-fuel casks.** Wells, A.H. (Nuclear Assurance Corp.). *Transactions of the American Nuclear Society;* **53**: 108(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Utility fuel managers have become very interested in higher burnup fuels as a means to reduce the impact of refueling outages. High-burnup fuels have significant effects on spent-fuel storage or transportation casks because additional heat rejection and shielding capabilities are required. Some existing transportation casks have useful margins that allow shipment of high-burnup fuel, especially the NLI-1/2 truck cask, which has been relicensed to carry pressurized water reactor (PWR) fuel with 56,000 MWd/ton U burnup at 450 days of cooling time. New cask designs should consider the effects of high burnup for future use, even though it is not commercially desirable to include currently unneeded capability. In conclusion, the increased heat and gamma radiation of high-burnup fuels can be accommodated by additional cooling time, but the increased neutron radiation source cannot be accommodated unless the balance of neutron and gamma contributions to the overall dose rate is properly chosen in the initial cask design. Criticality control of high-burnup fuels is possible with heavily poisoned baskets, but burnup credit in licensing is a much more direct means of demonstrating criticality safety.

15911 **Application of systems engineering to fuel processing activities.** Aitken, E.A.; Thompson, M.L. (General Electric, Sunnyvale, CA). *Transactions of the American Nuclear Society;* **53**: 117-118(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The systems engineering process has been applied to several fuel processing tasks ranging from large, long-term fuel fabrication/reprocessing operations to a small, short-term component development in ongoing fuel production operations. These diverse applications enable one to develop a systems engineering process with flexibility, depending on the environment and the nature of the problem. This presentation describes three problems that were experienced by the authors in implementing the systems engineering process.

15912 **Prudence reviews, with hindsight.** Fakonas, A.D.; Grender-Jones, D. *Transactions of the American Nuclear Society;* **53**: 371(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper sets out the authors' views on the use of consultants by utilities in preparing for regulatory commission reviews of nuclear power plant construction projects. These views are based on the authors experience working with utilities in nuclear plant prudence reviews. Although the limited number of nuclear power plants now under construction means that prudence reviews of such projects will, within a few years, be things of the past, there is evidence that the successes of commissions and their staffs in denying recovery of significant capital expenditures by utilities is prompting increased attention on other aspects of utility activities, such as the management of power plant outages for maintenance or retrofits. The views expressed in this paper will still be relevant even after current nuclear construction projects are completed.

15913 **Nuclear power plant performance incentives established by state PUCs.** Petersen, J.C. (Nuclear Regulatory Commission, Washington, DC). *Transactions of the American Nuclear Society;* **53**: 371-372(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Performance incentives (or incentive plans, efficiency incentives) are mechanisms used by state public utility commissions (PUCs) to measure a utility's efficiency level in operating or constructing generating plants and to financially reward or penalize the utility for performance above or below established levels. The objective of incentive plans is to encourage sustained improved performance. Performance incentives are applicable to the construction or operation of about 37 nuclear power reactors owned by 25 utilities in 15 states. Several additional states are considering nuclear plant incentives. The US Nuclear Regulatory Commission (NRC) Office of State Programs tracks nuclear power plant performance incentives and provides periodic reports to NRC program offices and regional offices because of the staff's concerns that some incentives may have impacts on safe construction or operation of a plant. The periodic, updated reports cover new and revised incentives applicable to specific nuclear plants and report on experience with existing incentive plans. This paper (a) discusses the NRC staff's concerns about possible or potential safety effects of incentives, and (b) summarizes results of the staff's tracking of the incentives.

15914 **Nuclear rate regulation.** Nandy, F.R.; Klapka, P.B. (Southern California Edison Co.). *Transactions of the American Nuclear Society;* **53**: 372-373(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In recent years, as nuclear power projects have been completed and entered into rates, regulatory agencies such as state public utilities commissions and the Federal Energy Regulatory Commission have increased their examination of utility nuclear power plant construction and management. Southern California Edison (SCE) formed the Nuclear Rate Regulation Organization to serve as the clearinghouse for nuclear rate information to respond to this increased attention from the regulatory agencies. The primary purpose of the organization would be to provide consistency of information and policy to be submitted to regulatory agencies. This information supporting ratemaking activities consists of preparation and justification of the following: 1) operation and maintenance expenses; 2) capital plant addition expenses; 3) energy forecast and fuel expenses; 4) plant operation and outages; and 5) support of other special regulatory investigations.

15915 **Schedule reconciliation tests for management prudency determination.** Howell, G.E. *Transactions of the American Nuclear Society;* 53: 373(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The prudency audit of a nuclear project involves engineering, construction, financial, and management dimensions. The audit must retrospectively evaluate the decisions and actions of management decision makers and then equitably allocate the cost impacts of those decisions and actions in a comprehensive and objective manner. In most situations, determination of the impact of schedule delays is a paramount issue. Manzi & Associates uses an approach to schedule reconciliation that focuses on the site-specific, as-built condition. The as-built schedule model is analyzed by a backward pass, or but-for methodology which focuses on the causes and impacts of identified delays. The objective is to demonstrate that but-for the identified delay, the project could have been built in the as-planned time frame. The but-for methodology has been used in many contract dispute cases and is currently being applied to schedule reconciliation on several nuclear plants. The potential for applying this methodology to both new construction and retrofit projects is great.

15916 **Utility prudency issues.** Charnoff, G. *Transactions of the American Nuclear Society;* 53: 373-375(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The conventional legal standard of prudence found in the common law of public utility regulation precludes a judgment about past decisions based on present knowledge of whether the decisions proved in time to have been right or wrong. The proper inquiry is not whether every management decision proved to be correct. Rather, the proper inquiry as stated by the New York Public Service Commission in Re Consolidated Edison Co. of New York, Inc. is ...whether the company's conduct was reasonable at the time, under all of the circumstances, considering that the company had to solve its problems prospectively.... The exercise of prudence does not guarantee performance on schedule or within budget, or the making of correct decisions, when judged after the fact. But it does require or involve the exercise of reasoned decision making within a framework of reasonably available alternatives.

15917 **Organization and management of heterogeneous, dispersed data bases in nuclear engineering.** Eastman, C.M. (Carnegie-Mellon Univ., Pittsburgh, PA). *Transactions of the American Nuclear Society;* 53: 382(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Large, complex, multiperson engineering projects in many areas, nuclear, aerospace, electronics, and manufacturing, have inherent needs for coordination, control, and management of the related engineering data. Taken in the abstract, the notion of an integrated engineering data base (IED) for such projects is attractive. The potential capabilities of an (IED) are that all data are managed in a coordinated way, are made accessible to all users who need it, allow relations between all parts of the data to be tracked and managed, provide backup, recovery, audit trails, security and access control, and allow overall project status to be monitored and managed. Common data accessing schemes and user interfaces to applications are also part of an IED. This paper describes a new software product that allows incremental realization of many of the capabilities of an IED, without the massive disruption and risk.

15918 **Development of a microcomputer data base of manufacturing, installation, and operating experience for the NSSS designer.** Borchers, W.A.; Markowski, E.S. (Combustion Engineering, Inc.). *Transactions of the American Nuclear Society;* 53: 385(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Future nuclear steam supply systems (NSSSs) will be designed in an environment of powerful micro hardware and software and these systems will be linked by local area networks (LAN). With such systems, individual NSSS designers and design groups will establish and maintain local data bases to replace existing manual files and data sources. One such effort of this type in Combustion Engineering's (C-E's) NSSS engineering organization is the establishment of a data base of historical manufacturing, installation, and operating experience to provide designers with information to improve on current designs and practices. In contrast to large mainframe or minicomputer data bases, which compile industry-wide data, the data base described here is implemented on a microcomputer, is design specific, and contains a level of detail that is of interest to system and component designers. DBASE III, a popular microcomputer data base management software package, is used. In addition to the immediate benefits provided by the data base, the development itself provided a vehicle for identifying procedural and control aspects that need to be addressed in the environment of local microcomputer data bases. This paper describes the data base and provides some observations on the development, use, and control of local microcomputer data bases in a design organization.

15919 **Looking out for common cause failures.** Crellin, G.L.; Mott, J.E.; Smith, A.M.; Worledge, D.H. *Transactions of the American Nuclear Society;* 53: 389-390(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Common cause failures (CCFs) have been a continuing concern in nuclear plant operation; first, because they do occasionally occur, and second, because probabilistic risk assessment studies indicate that CCFs are potentially significant risk contributors due to the success of defenses against multiple, independent failures. A comprehensive Electric Power Research Institute, (EPRI) study of CCFs has (a) developed a well-defined classification system for analyzing fault events, and (b) studied licensee event report data for the auxiliary feedwater system (AFWS) and reactor protection system (RPS) using this classification system and analysis of root cause, failure modes, detection methods, corrective actions, and defensive measures. In this work, the confusion generally encountered with the definition of CCF has been resolved by directing attention to branched events - i.e., any event in which a root or component cause resulted in concurrent, multiple unavailabilities (either physical failure or functional unavailability). The current emphasis in the EPRI project is on defensive measures against branched events. This paper discusses some preliminary project results.

15920 **Nuclear power and economics: keys to continuing progress.** Leclercq, J. (Electricite de France's, Paris). *Transactions of the American Nuclear Society;* 53: 433-434(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Today, Electricite de France's (EdF's) chief concern is to keep close check on the performance and economics of its nuclear power reactors and to prepare for the future. The practice of building power plants in series and on a large scale has involved special constraints. This is true in particular of the pressurized water reactor series, which includes 39 standardized 900- and 1300-MW units with a total capacity of 37,000 MW. This paper deals with the areas on which EdF is currently focusing its development efforts.

15921 **Striving for excellence.** Vaughn, G.E. (Duke Power Co., Charlotte, NC). *Transactions of the American Nuclear Society;* **53**: 434-435(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

With guidance and assistance from the Institute of Nuclear Power Operations (INPO), nuclear utilities are striving for excellence by making steady improvements in industry performance indicators. Duke Power Company has solidly committed to support the industry's effort to obtain higher standards of excellence. Dedicated, highly trained employees, who are motivated to making it happen, carry out this commitment within a management framework which includes: 1) top management support and direct involvement; 2) a strategy to achieve excellence over the long run; 3) a nuclear management priority structure; and 4) a goals program.

15922 **New approaches to performance-based project management training.** Spitulnik, J.J.; Rath, W.R. (Cygna Energy Services, Boston, MA). *Transactions of the American Nuclear Society;* **53**: 65-66(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Installing modifications to a nuclear generating facility present challenges beyond the engineering and design tasks necessary to fix the problem. Starting with problem identification, every engineering task associated with a modification, every engineering task associated with a modification can be complemented with a dozen nonengineering tasks. It is not unusual for these other tasks to represent most of the time and much of the money devoted to a modification. Modification process workshops prepared for nuclear utilities have proven successful in providing a foundation on which engineers can build their expertise in performing plant modifications. This paper describes these programs. Three types of modification workshops have been developed to provide these process skills. The first was for recent engineering graduates and was prepared in conjunction with a 6-week engineering training program that included basic training on plant technology, regulatory agencies, and codes and standards. The second program was for seasoned engineers and technicians who worked for a utility that just implemented a new modification control process. The third program was developed for the central design organization of a multiplant utility. This organization is responsible for managing modifications at all of the utility's nuclear plants, and the students were experienced engineers who were either new to the company or transferred from other departments.

15923 **Monitor III.** Grisham, D.L.; Lambert, J.E. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 509(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Monitor III is a totally portable version of the Monitor I and II systems in use at the Clinton P. Anderson Meson Physics Facility (LAMPF) since 1976. The Monitor III system differs from the other systems in that it is capable of operating in any location accessible by truck. Although Monitor III was designed primarily for the handling and disposal of radioactive materials, it is also capable of performing the more sophisticated operations normally performed by the other Monitor systems. The development and operational capabilities of the Monitor remote handling system have been thoroughly reported since 1978. This paper reports on the commissioning of a new system with unique capabilities.

22 NUCLEAR REACTOR TECHNOLOGY

REFER ALSO TO CITATION(S) 16160

15924 **(DOE/OR/00033—T252) Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Nuclear engineering and health physics fellowship, 1985-1986.** (Oak Ridge Associated Universities, Inc., TN (USA)). 1986. Contract AC05-76OR00033. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004879.

Progress is reported in the nuclear engineering and health physics elements of the fellowship program. Statistics are given on numbers of student applications and new appointments, the degree areas of applicants, GPA and GRE score averages of the fellows, and employment of completed fellows. (LEW)

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 15963, 16164, 16448, 16620

15925 **(EIR—601) Digital generation of stochastic signals of arbitrary spectral shape.** Behringer, K.; Nishihara, H.; Spiekerman, G. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Oct 1986. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700692.

For computer-simulation experiments in the development of noise monitoring systems three methods of generating ergodic Gaussian random noise with specified spectral properties have been investigated: digital filtering of white noise optimum symmetric FIR filters, a modified Rice formulation and an approximation of the Kac representation of noise. The proposed modified Rice formulation is a new noise generation method which is most efficient with regard to the computation time. By windowing subsequent Rice sequences a smooth noise record of any desired length can be produced.

15926 (INIS-mf—10554, pp 15-20) **Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 1.** Rataj, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

The most important methods are briefly described of solving the Boltzmann equation describing neutron transport, such as are used at UJV Rez. These are the methods of P/sub N/-approximation, the S/sub N/ method, further the Monte Carlo method and the moments method in which the solution of the Boltzmann equation describing the spatial and energy distribution of neutron flux density proceeds from the system of equations given by the P/sub N/-approximation. It is emphasized that the results are loaded with a big error or are totally erroneous when inaccurate cross sections or unsuitable libraries of cross sections are used. (J.P.).

15927 (INIS-mf—10554, pp 21-35) **Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 2.** Valenta, V. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

Special procedures have been developed for fast computations with modest demands on computer memory. The principle underlying the so-called removal method is the multigroup approach, separation of primary fluxes and their calculation using the integration of point kernels. Included in the primary fluxes are nonscattered neutrons and small-angle scattered neutrons. Primary flux neutrons are the source for solving scattered radiation fluxes which are calculated in the diffusion approximation or in the P/sub 1/-approximation. A number of one- and two-dimensional programs have been written based on these methods. The determination is described of cross sections and group constants, and problems of numerical calculations and the method of kernels are dealt with. Macrocomputations of the reactor core are performed by few-group diffusion programs (the BIPR, MOBY-DICK codes), computations of spectra in cells by MICROS, MICROBE-02 program packages. Sources of errors in the calculation of shielding are given. (J.P.).

15928 **Parity simulation for nuclear plant analysis.** Hansen, K.F.; Depiente, E. (Massachusetts Institute of Technology, Cambridge). *Transactions of the American Nuclear Society;* **53**: 250-251(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The analysis of the transient performance of nuclear plants is sufficiently complex that simulation tools are needed for design and safety studies. The simulation tools are needed for design and safety studies. The simulation tools are normally digital because of the speed, flexibility, generality, and repeatability of digital computers. However, communication with digital computers is an awkward matter, requiring special skill or training. The designer wishing to gain insight into system behavior must expend considerable effort in learning to use computer codes, or else have an intermediary communicate with the machine. There has been a recent development in analog simulation that simplifies the user interface with the simulator, while at the same time improving the performance of analog computers. This development is termed parity simulation and is now in routine use in analyzing power electronic network transients. The authors describe the concept of parity simulation and present some results of using the approach to simulate neutron kinetics problems.

15929 **GPT methods for fuel evolution and shuffling studies.** Gandini, A. *Transactions of the American Nuclear Society;* 53: 251-253(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Extension of the heuristically based generalized perturbation theory (GPT) methodology to neutron-nuclide evolution analysis in nuclear reactor systems has been already demonstrated. A calculational scheme related to this methodology is here described, by which standard available GTP codes can be adopted. The use of GPT techniques for fuel shuffling studies is also described.

15930 **System reliability analysis via generalized perturbation theory methods.** Gandini, A. *Transactions of the American Nuclear Society;* 53: 265-266(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the probabilistic analysis of systems, a key point is identification of the important components. Such identification is in fact required in assisting the analyst to find weaknesses in design and operation and in suggesting optimal modifications for system upgrade. A number of methods have been suggested so far to evaluate the importance of basic components, generally based on the well-known Birnbaum's importance concept. A sensitivity methodology, mainly concerned with basic component parameters, is proposed here in relation to the Markov chain model and based on importance concepts widely used so far in nuclear reactor physics.

15931 **Feedback simulation of ramped power transients using transfer functions.** Grimm, K.N.; Meneghetti, D. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* 53: 460-462(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The dynamic simulation of reactor transients is important in determining the feedback and temperature responses of various subassembly components. One method of determining component feedbacks (or associated temperature increments) is by using the feedback reactivity transfer functions of the system. For any variation of power with time the component feedback reactivity responses are then obtained by the convolutions of the feedback reactivity transfer functions and the fractional change in system power. (The nodal feedback reactivity transfer functions for the system were obtained, using the EROS computer code, from nodal feedback responses for a step change in power.) This paper discusses the application of these transfer functions in calculating nodal feedback reactivities in the experimental breeder reactor-II (EBR-II) reactor assuming a fractional power shape that can be defined by a series of ramp inputs. For a comparison, these transfer-function calculated nodal reactivities are compared with nodal reactivities calculated using the EROS kinetics code assuming an input reactivity which gives the described ramp power shape.

15932 **PPC - an interactive preprocessor/compiler for the DSNP simulation language.** Mahannah, J.A.; Schor, A.L. (Massachusetts Institute of Technology, Cambridge). *Transactions of the American Nuclear Society;* 53: 42-43(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The PPC preprocessor/compiler was developed for the dynamic simulator for nuclear power plant DSNP simulation language. The goal of PPC is to provide an easy-to-use, interactive programming environment that will aid both the beginner and well-seasoned DSNP programmer. PPC simplifies the steps of the simulation development process for any user. All will benefit from the on-line help facilities, easy manipulation of modules, the elimination of syntax errors, and the general systematic approach. PPC is a very structured and modular program that allows for easy expansion and modification. Written entirely in C, it is fast, compact, and portable. Used as a front end, it greatly enhances the DSNP desirability as a simulation tool for education and research.

15933 **Graduate student use of DSNP at Idaho State University.** Larson, H.A.; Charyulu, V.P. (Idaho State Univ., Pocatello). *Transactions of the American Nuclear Society;* 53: 43-44(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Several projects were assigned to graduate students at Idaho State University (ISU) involving the dynamic simulator for nuclear power plants (DSNP) computer language. These projects either led, or are intended to lead, to master's degrees in nuclear science. The studies were all performed using the latest version of DSNP installed in Argonne National Laboratory's (ANL's) IBM 3033 computers in Argonne, Illinois. The projects described here were educationally useful in that they provided the following: 1. an engineering learning experience; 2. students had the opportunity to solve the problem of representing physical descriptions and experimental data with numerical simulation; 3. mutually beneficial interaction between the graduate students and ANL scientists; 4. some financial and equipment support for the students; and 5. in one case, the base study for the development of a master's thesis.

15934 **Special simulation programs generated by DSNP for educational uses.** Madell, J.T. *Transactions of the American Nuclear Society;* 53: 44-45(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The DSNP (dynamic simulator for nuclear power plants) language is a high-level simulation language whose translator writes FORTRAN programs for reactor system transient analyses. The high-level character of DSNP greatly facilitates the generation of FORTRAN programs, which may then be duplicated on floppy disks for execution on personal computers (PCs). A student's understanding of reactor dynamic principles may be enhanced by running extensive parametric studies as either a classroom or special project exercise. This DSNP capability was demonstrated, in principle, by the simulation of an entire primary system in a program that was modified, down-loaded, and run on a microcomputer. The demonstration uncovered two drawbacks: extensive editing of the DSNP-generated FORTRAN program for consistency with microcomputer software and long running times on the PC. The DSNP translator was recently revised to produce programs consistent with the microcomputer software. Elimination of the second drawback is the subject of this paper.

15935 **Input and control management scheme for the DSNP simulation language.** Mesman, L.M.; Meneley, D.A. (Univ. of New Brunswick, Fredericton). *Transactions of the American Nuclear Society;* 53: 50-51(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The simulation language identified as the dynamic simulator for nuclear plants (DSNP) provides a flexible powerful framework from which to construct transient simulation models. This capability is very important to a university department involved in the teaching of nuclear engineering at the undergraduate and graduate levels. However, the educational environment also includes restraints; few of the potential users are experienced in computer usage. Even for experienced users, preparation of input for a typical transient simulation is an onerous task that is susceptible to error. Reference to printed documentation becomes a lengthy proc-

ess. The flexibility of a package such as DSNP also carried a penalty - the user must properly define relationships among all components of the problem as well as the computational procedures for its solution in the form of a simulation driver routine in a special language with its own syntax. For these reasons, a development project was undertaken at the University of New Brunswick with the goal of simplifying the DSNP input structure and providing features to reduce input error rates.

15936 **Nuclear thermal-hydraulics education: the Yankee Atomic/University of Lowell experience.** Husain, A.; Brown, G.J.; Yeung, W.S. (Yankee Atomic Electric Co.). *Transactions of the American Nuclear Society;* **53**: 53(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper summarizes the long and meaningful relationship between the University of Lowell (UL) and Yankee Atomic Electric Company (YAEC) in the area of nuclear thermal hydraulics. The UL has actively interacted with YAEC for many years. Many UL graduates from the nuclear program as well as health physics and other disciplines are employed by YAEC. Furthermore, many students have worked for YAEC on a part-time basis through summer employment or the coop program. Several graduate students have completed their thesis work under the joint direction of UL and YAEC personnel, and some faculty members have had consulting and research contracts with the company. At the same time, YAEC employees have taken advantage of the graduate program offered by UL and have earned advanced degrees. Some YAEC personnel have taught courses at UL and have served on the industrial advisory committees.

15937 **Thermal hydraulics in undergraduate nuclear engineering education.** Theofanous, T.G. (Univ. of California, Santa Barbara). *Transactions of the American Nuclear Society;* **53**: 53-54(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The intense safety-related research efforts of the seventies in reactor thermal hydraulics have brought about the recognition of the subject as one of the cornerstones of nuclear engineering. Many nuclear engineering departments responded by building up research programs in this area, and mostly as a consequence, educational programs, too. Whether thermal hydraulics has fully permeated the conscience of nuclear engineering, however, remains yet to be seen. The lean years that lie immediately ahead will provide the test. The purpose of this presentation is to discuss the author's own educational activity in undergraduate nuclear engineering education over the past 10 yr or so. All this activity took place at Purdue's School of Nuclear Engineering. He was well satisfied with the results and expects to implement something similar at the University of California in Santa Barbara in the near future.

15938 **Thermal hydraulics in nuclear engineering at UIUC.** Jones, B.G. (Univ. of Illinois, Urbana). *Transactions of the American Nuclear Society;* **53**: 54-55(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Department of Nuclear Engineering at the University of Illinois, Urbana-Champaign, has a broad-based series of courses and research studies in nuclear thermal hydraulics and related areas. In order to sustain a viable series of courses from introductory undergraduate through advanced graduate levels, a mixture of courses, some taught within the department and some offered by other engineering departments, is used. This conserves faculty teaching time and maintains sufficient class enrollments to provide a regular offering schedule.

15939 **Green's function for the evaluation for neutron cross sections.** Stevenson, B. (New Jersey Institute of Technology, Newark). *Transactions of the American Nuclear Society;* **53**: 58-59(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The author develops a Green's function for the evaluation of neutron cross sections as illustrated by an example which also provides a check of the validity of the procedure described.

15940 **USNY college degrees: three successful collaborations to fulfill NRC requirements.** Headley-Walker, L.; DeSain, G. (Univ. of the State of New York, Albany). *Transactions of the American Nuclear Society;* **53**: 63-64(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Within the last few years, an evident need has surfaced in the nuclear industry regarding the necessity for degreed individuals on shift. While nuclear utility management has attempted to accommodate this direction in a variety of ways, none is as unique as the collaborative model developed by the University of the State of New York (USNY) Regents College Degrees (RCDs). This paper reviews USNY's collaborative efforts to provide degree programs for senior reactor operators to utilities and presents three models for degree completion used at Maine Yankee Nuclear Power Plant, New York Power Authority, and Pacific Gas & Electric. Several other utilities are utilizing the collaboration model, and while these are not discussed in detail, information about their progress is available.

15941 **University papers in American Nuclear Society (ANS) transactions with enrollment and degrees-III.** Duffey, D.; Wiggins, P.F. (Univ. of Maryland, College Park). *Transactions of the American Nuclear Society;* **53**: 64-65(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Statistics on nuclear engineering course offerings, enrollment, degrees, and papers published in the American Nuclear Society (ANS) Transactions were presented in 1966 at a conference at the University of West Virginia and in several subsequent publications. Since the 1970s, enrollment and degree data have been compiled by the US Department of Energy and its predecessors. These are the latest statistics. Universities, with perhaps 300 professors of nuclear engineering, continue to contribute substantially to the Transactions. Identification of nuclear engineering at universities is suffering because of reduced enrollment and much less graduate research support. This and the foreign student situation deserve serious attention by those concerned with nuclear engineering in university, government, and industrial communities.

15942 **Diversion cross-flow mixing at the inlet of a simulated rod bundle using a gamma camera.** Sedaghat, A.; Macduff, R.; Castellana, F. (Columbia Univ., New York, NY). *Transactions of the American Nuclear Society;* **53**: 534-535(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The prediction of diversion cross-flow and turbulent mixing interests reactor vendors and nuclear fuel suppliers because of the effect on critical heat flux. In single-phase flow with uniform inlet conditions, flow diversion occurs primarily near the inlet. Prior work by Bowring and Levy and Lahey estimated diversion length by comparing the axial pressure differential at the channel exit using isokinetic (natural flow split) and nonisokinetic (forced flow split) sampling and by using a mathematical model. The present work, sponsored by Exxon Nuclear Company, Inc., represents the first study in which flow distribution and diversion cross flow were investigated at the inlet of a clean geometry. The parameters investigated were diversion length and the effective cross-flow velocity was determined by analysis. The results of this work were compared to theoretical values predicted by the COBRA IIIC subchannel computer code. The difference between experimental data and COBRA IIIC suggests that a more comprehensive transverse momentum balance is desired as mass flux ratios become large. The inclusion of transverse inertia and acceleration terms in the transverse momentum balance become important.

15943 **DNB prediction in assemblies with mixing vanes and unheated tubes.** Weisman, J.; Lim, J.C.; Ying, S.H. (Univ. of Cincinnati, OH). *Transactions of the American Nuclear Society;* **53**: 548-549(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the current study, the Weisman-Pei predictive procedure is applied to departure from nucleate boiling (DNB) data obtained with heater-rod assemblies having mixing vanes attached to the support grids. The data first chosen for examination were obtained in six tests of 16- and 25-rod electrically heated bundles. The tests covered three different mixing vane grids, two rod diameters, included both uniform and nonuniform axial heat fluxes and rod lengths from 2.4 to 4.3 m. Pressure ranged from 103 to 166 bar, mass flux from 4.8 to 17.6 kg/m^2 h and the average void fraction at the DNB location was below 0.65. The data analysis allowed for the effect of the mixing vanes by appropriately increasing the mixing coefficient used by COBRA. The prediction procedure remained unchanged otherwise.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 15684, 15687, 15709, 15716, 15719, 15855, 16042, 16047, 16048, 16049, 16050, 16097, 16124, 16278, 16475, 17516

15944 (EPRI-CS—4748, pp 1.65-1.84) **Nuclear power station predictive on condition analysis program for rotating machinery.** Nicholls, R.E. (Virginia Electric and Power Company, Richmond). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

This presentation is designed to introduce to the generating utilities what is perhaps the finest opportunity to enhance major production related, rotating equipment reliability and the generating units availability, more than any single entity within our power, but there are keys to its success. The description of administrative structuring, coupled with the state of the art in spectrum analyzers, computers and other support equipment used in aiding discrete frequency analysis, is the foundation of this technology. 6 figures.

15945 (EPRI-CS—4748, pp 4.135-4.159) **Acoustic leak detection in nuclear power plants.** McElroy, J.W. (Philadelphia Electric Co., PA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

For several years now, utilities have been utilizing acoustic leak detection methods as an operating tool in their nuclear power stations. The purpose for using the leak detection system at the various stations vary from safety, ALARA, improved operations, preventive maintenance, or increased plant availability. This paper describes the various acoustic techniques and their application. The techniques are divided into three categories: specific component leakage, intersystem leakage, and pipe through-wall crack leakage. The paper addresses each category in terms of motivation to monitor, method of application and operation, and benefits to be gained. Current requirements are reviewed and analyzed with respect to the acoustic techniques. The paper shows how acoustic leak detection is one of the most effective leak detection tools available. 9 figures, 1 table.

15946 (EPRI-CS—4748, pp 5.1-5.9) **Reactor coolant pump seal leakage monitoring.** Stevens, D.M.; Spencer, J.W.; Morris, D.J.; James, W.; Shugars, H.G. (Babcock & Wilcox, Lynchburg, VA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

Problems with reactor coolant pump seals have historically accounted for a large percentage of unscheduled outages. Studies performed for the Electric Power Research Institute (EPRI) have shown that the replacement of coolant pump seals has been one of the leading causes of nuclear plant unavailability over the last ten years. Failures of coolant pump seals can lead to primary coolant leakage rates of 200-500 gallons per minute into the reactor building. Airborne activity and high surface contamination levels following these failures require a major cleanup effort and increases the time and personnel exposure required to refurbish the pump seals. One of the problems in assessing seal integrity is the inability to accurately measure seal leakage. Because seal leakage flow is normally very small, it cannot be sensed directly with normal flow instrumentation, but must be inferred from several other temperature and flow measurements. In operating plants the leakage rate has been quantified with a tipping-bucket gauge, a device which indicates when one quart of water has been accumulated. The tipping-bucket gauge has been used for most rainfall-intensity monitoring. The need for a more accurate and less expensive gauge has been addressed. They have developed a drop-counter precipitation sensor has been developed and optimized. The applicability of the drop-counter device to the problem of measuring seal leakage is being investigated. If a review of system specification and known drop-counter performance indicates that this method is feasible for measuring seal leak rates, a drop-counter gauge will be fabricated and tested in the laboratory. If laboratory tests are successful the gauge will be demonstrated in a pump test loop at Ontario Hydro and evaluated under simulated plant conditions. 3 references, 2 figures.

15947 (EPRI-CS—4748, pp 5.11-5.34) **Monitoring and diagnostic system for reactor coolant pump seals.** Stevens, D.M.; Spencer, J.W.; Morris, D.J.; Glass, S.W.; Sommerfield, G.A.; Harrison, D. (Babcock & Wilcox, Lynchburg, VA). Oct 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920073. (CONF-8410452—).

From 2. EPRI incipient-failure detection conference; Lake Buena Vista, FL, USA (10 Oct 1984).

The Babcock & Wilcox Company has developed and implemented a Reactor Coolant Pump Monitoring and Diagnostic system (RCPM & DS). The system has been installed at Toledo Edison Company's Davis-Besse Nuclear Power Station Unit 1 where it continuously monitors a number of indicators of pump performance. The RCPM & DS notifies the plant operator of out-of-tolerance conditions or pump performance trending toward out-of-tolerance conditions. Pump seal parameters being monitored include pump internal pressures, temperatures, and flow rates. Rotordynamic performance and plant operating conditions are also measured with a variety of dynamic sensors. This paper describes the implementation of the system and the results of on-line monitoring of four RC pumps. 4 references, 14 figures, 1 table.

15948 **(EPRI-NP—4222-Vol.3) Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report.** King, P.J.; Warr, B.D. (Ontario Hydro, Toronto (Canada). Research Div.; Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 49p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920215.

Constant extension rate stress corrosion testing was performed to determine if exposure to CAN-DECON decontamination solvent would change the SCC susceptibility of sensitized type 304 stainless steel. Specimens that had been subjected to decontamination treatments of 20, 100, and 500 h were tested at 287°C in high purity water containing 200 ppB O_2 at strain rates from 10^{-7} to 10^{-6} sec^{-1}. Compared to non-decontaminated control specimens there was no observed effect of CAN-DECON treatments of 20 or 100 h. Only samples exposed to CAN-DECON from 500 h indicated an increased SCC susceptibility. Possible contributing factors to this effect are shallow intergranular attack and surface chemistry changes, although their roles were not substantiated in this work. Specific conclusions regarding the effect of CAN-DECON on the SCC susceptibility of in-service BWR piping could not be drawn from this work.

15949 (INIS-mf—10554, pp 97-102) **Monitoring radiation damage of reactor structural materials.** Brumovsky, M. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

The effects are described of neutrons on the material of the pressure vessel. The most important change in the properties of the material is radiation embrittlement and radiation hardening. The effect of parameters of the neutron field is assessed, i.e., the neutron energy spectrum and total neutron fluence. The procedure of evaluation of radiation damage to the material of the pressure vessel is shown on a diagram. (E.S.).

15950 **Welding nuclear plant components.** Zeuthen, A.W. (LILCo, Shoreham, England). *Transactions of the American Nuclear Society;* **53**: 211-212(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

More than 100 nuclear plants have been constructed and are operating in the US. From the safety standpoint and for a minimum of outage time, the welding of nuclear components must be of the highest quality. During construction, automatic welding was successfully used at a number of sites. As operating plants have functions for a number of years, radiation levels have increased to the extent that exposure of welding personnel must be limited. This paper covers new advances in welding for the repair of the nuclear components.

15951 **Analyses of solid-state track recorder pressure vessel neutron dosimetry.** Ruddy, F.H.; Seidel, J.G.; Manhardt, A.E. (Westinghouse Research & Development Center, Pittsburgh, PA). *Transactions of the American Nuclear Society;* **53**: 398-399(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The preparation and deployment of neutron dosimeters based on the measurement of neutron-induced fission rates using solid-state track recorders have been described previously. Dosimetry sets containing ultra-low-mass fissionable deposits of ^{235}U, ^{238}U, ^{237}Np, and ^{239}Pu have been placed in the reactor cavity region of a number of operating commercial power reactors to obtain neutron dosimetry data that can be used to deduce the radiation exposure to the reactor pressure vessel (RPV). These measurements and other dosimetry results are used to calculate the resulting radiation damage to ensure safe operation of the RPV.

15952 **Motor-operated valve operability verification and trending from the motor control center.** Charbonneau, A.G. *Transactions of the American Nuclear Society;* **53**: 438(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Until recently, any maintenance or operational changes made to a motor-operated valve (MOV) raised questions regarding the operability of the valve during subsequent maximum differential pressure conditions. To respond to these concerns, in many cases, signature analysis performed at the MOV was necessary to verify operability. Elimination of this detailed testing was the goal of the developments described in this paper. The testing program demonstrated that a motor load (power) signal could be obtained and calibrated to maximum allowable MOV operating conditions during the baseline testing. The motor load signal proved to be far superior to motor current since it was more sensitive to load variations, could be reproduced more accurately (+/-3%), and was independent of typical plant voltage variations.

15953 **Correlation technique for single- and two-phase pump data.** Bozoian, M. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 526-528(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Generalizing, a quadratic single-phase homologous head equation for two-phase provides a means of correlating single- and two-phase data into two quadratic homologous equations void-dependent coefficients that can be polynomial functions of degree n. In addition to conveniently condensing large amounts of single- and two-phase data into two relatively simple algebraic equations, this new correlation also demonstrates that homologous and void fraction dependencies are, in general, not separable for two-phase pump flow.

15954 **Efficiencies of CSP plans in quality control.** Bement, T.R.; Bryson, M.C. (Los Alamos National Lab., Los Alamos, NM 87545). pp 355-361 of Proceedings of the 38th annual quality congress. Milwaukee, WI; American Society for Quality Control (1984). (CONF-840569—).

From 38. ASQC annual quality congress; Chicago, IL, USA (14 May 1984).

Continuous sampling plans such as the Dodge CSP-3 plan are often used to obtain high quality at low QC cost. In CSP-3 individual production line items are at first inspected at a 100% level. If several consecutive items are found to have no defects, the plan calls for dropping into a sampling mode where some fraction of items from the line are inspected. If a defect is found, than a temporary 100% inspection mode is adopted where some number of items (fixed at four by Dodge) is inspected; if there is a defect among them, then the plan calls for going back to 100% inspection. Conventional CSP-3 analysis calls for the four items in the temporary 100% inspection mode to be selected as a batch and inspected in toto. With production-line sampling, a reasonable alternative is to inspect them one at a time and revert to 100% sampling as soon as one of them is found to be defective. This paper investigates the effect on cost and on outgoing quality of the different modes of operation. Whether this kind of CSP plan makes sense economically depends on the pattern of production defects. The plan is specifically designed to provide protection against a production pattern that causes some clustering of defects. Some Monte Carlo simulations are used to investigate the kinds of patterns that can economically be countered by use of a CSP-3 type plan. Consideration include the pattern of defects, the parameters of the plan (including the number of items in temporary 100% inspection, which could vary from four), and the relative costs of inspecting items and passing defective ones.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 15909, 16043

15955 **(BARC—1250) Computerised automatic pellet inspection unit for FBTR fuel.** (Bhabha Atomic Research Centre, Bombay (India)). 1984. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701247.

Physical inspection and certification of nuclear reactor fuel element components is an activity demanding utmost imagination and skill in devising accurate measuring systems. There is also need for remote handling, automation, rapid processing and inspection data print out when dealing with reactor fuel material. This report deals with an automatic computerised fuel pellet inspection system that has been developed in Radiometallurgy Division, B.A.R.C. to carry out dimensional and weight measurements on fuel pellets for the Fast Breeder Test Reactor (FBTR) at Kalpakkam near Madras. The system consists of several subsystems each developed especially for a specific purpose and as such items are not available off the shelf from manufacturers in India. If a general approach is adopted towards the report, there are many innovations and ideas that can be used in the automatic inspection of a variety of products in industry. As the system is fairly involved the report does not attempt to deal with detailed description of the equipment. The function of the system is to accept a certain quantity of fuel pellets in a bowl feeder, separate the pellets rejected owing to their exceeding dimensional and weight limits and form columns of accepted pellets. Dimensional and weight limits can be set as required and all inspection data are presented in a printed format. The system processes pellets at the rate of 15 per minute. The entire system can be run by operators with no special skills. The unit is currently in use for the inspection of mixed carbide fuel pellets for FBTR. 7 figs.

15956 **Integral fuel burnable absorber experience in two- and three-loop cores.** Simmons, R.L.; Jones, N.D.; Pritchett, J.E.; Mueller, D.E.; Popa, F.D. (Westinghouse Electric Corp., NFD, Pittsburgh, PA). *Transactions of the American Nuclear Society;* **53**: 88-89(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this paper is to describe the planned use of an integral fuel burnable absorber (IFBA) in two demanding loading patterns. The IFBA used in a thin boride coating on the surface of the fuel pellet. Typically, ~30% of the fuel rods in an assembly contain coated pellets. The first loading pattern is for a three-loop core that has twice-burned fuel in all baffle locations except for one location in the eighth core. The second pattern is for a two-loop core, annual cycle. IFBAs have been successfully used in difficult two- and three-loop very low leakage loading patterns. These patterns would not have been possible with discrete burnable absorbers. Even if discrete burnable absorbers could have been used, the cycle length would have been shorter than it will be with the patterns that use IFBAs.

15957 **Fuel/cladding chemical interaction correlation for mixed-oxide fuel pins.** Lawrence, L.A. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 213-215(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A correlation was developed relating the depth of fuel/cladding chemical interaction (FCCI) to fabrication and operating parameters for uranium-plutonium oxide fuel pins with 20% cold-worked Type 316 stainless steel cladding. The data base for the FCCI correlation included all the Hanford Engineering Laboratory reference oxide fuel pins irradiated in experimental Breeder Reactor-II. Previous FCCI correlations were based on smaller numbers of fuel pins primarily from the high cladding temperature P-23 series. The expanded data base includes 305 data sets from 104 fuel pins with peak fuel burnups to 17.2 at.% and peak cladding inner surface temperatures to 730°C. The increase in numbers of data sets as well as the broader range of applicability of the parameters in the revised wastage correlation provides greater assurance that predictions represent expected behavior.

2204 Control Systems

REFER ALSO TO CITATION(S) 15798, 16028

15958 (IAEA-TECDOC—384, pp 99-102) **Control system for the MNSR.** Sun Hong. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The MNSR has two modes of control: manual and automatic. The automatic system is based on the computer, PDP-11/34. Because the control system for the MNSR consists of only one control rod, the system for its control is correspondingly simple. Neutron flux levels can be adjusted between 1.0 x 10/sup 8/ to 1.2 x 10/sup 12/ n/s cm/sup 2/. A data logging and annunciation capability is also available 4 figs.

15959 (JINR—13-85-839) **Transfer function of a periodically pulsed reactor.** Popov, A.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700772.

For dynamic analysis a pulsed reactor is considered as a pulsed system with an ideal pulsed element. The reactivity power transfer function is obtained by control theory methods. It connects the curves of discrete functions - reactivity and power pulse energy. Unlike a generally accepted simple meanvalue reactor model, a pulsed reactor model is applicable to low frequency of power pulsed too. The calculated frequency characteristics of the IBR-2 pulsed reactor model are given. 7 refs.; 3 figs.

15960 (JINR—13-85-840) **Stability of a periodically pulsed reactor.** Popov, A.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700773.

To reveal the pulsed reactor stability area the Nyquist criteria for pulsed system is used. It is shown that the reactor is stable if its mean power is less than the boundary value. The boundary value increases with increasing the power pulse frequency and time constant of negative power feedback and with decreasing the transfer coefficient of feedback. Unlike a pulsed reactor model, a meanvalue reactor model giving a wrong results, when determining the stability region. 6 refs.; 1 tab.

15961 (JINR—R-11-85-344) **Program for smooth approximation of a function of two variables.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701338.

DSMAP program (FORTRAN-4, IBM EC computers) used to interpolate and smooth the real function of two variables is described. The DSMAP program is used for solving the problem of power distribution reconstruction in a power reactor core on the base of a fixed number of neutron emission detectors indications. The algorithm used is stable, it provides for necessary accuracy of calculations and obtaining the information on reactor core state in the on-line mode. Numeric experiments modeling functions with artificially introduced random errors show that the given algorithm of smooth approximation of data operates quickly and reduces the level of experimental noise at smoothing in several times. 1 ref.; 1 fig.; 3 tabs.

15962 (KIYI—85-19) **Calculation technique and results of nonstationary fields of energy release in RBMK reactors.** Khalimonchuk, V.A.; Kuchin, A.V.; Krayushkin, A.V.; Lavrenov, Yu.I. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 38p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700830.

The calculation procedure of nonstationary fields of energy release in reactors of RBMK type has been cited in adiabatic approximation taking account of nucleus concentration feedback of isotopes /sup 135/Xe, /sup 149/Sm, fast and delayed power effects of reactivity. The investigations have been carried out on deformations of radial fields of energy release in transients, connected with short stops of reactor. 3 refs.; 6 figs.; 8 tabs.

15963 **Implicit Kalman filter algorithm for nuclear reactor analysis.** Hassberger, J.A.; Lee, J.C. (Univ. of Michigan, Ann Arbor). *Transactions of the American Nuclear Society;* **53**: 249-250(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Artificial intelligence (AI) is currently the hot topic in nuclear power plant diagnostics and control. Recently, researchers have considered the use of simulation as knowledge in which faster than real-time best-estimate simulations based on first principles are tightly coupled with AI systems for analyzing power plant transients on-line. On-line simulations can be improved through a Kalman filter, a mathematical technique for obtaining the optimal estimate of a system state given the information contained in the equations of system dynamics and measurements made on the system. Filtering can be used to systemically adjust parameters of a low-order simulation model to obtain reasonable agreement between the model and actual plant dynamics. The authors present here a general Kalman filtering algorithm that derives its information of system dynamics implicitly and naturally from the discrete time step-series of state estimates available from a simulation program. Previous research has demonstrated that models adjusted on past data can be coupled with an intelligent controller to predict the future time-course of plant transients.

15964 **Backfit of advanced technology to improve plant operability and maneuverability.** Mueller, N.P. (Westinghouse Corp.). *Transactions of the American Nuclear Society;* 53: 400-401(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Expanding nuclear regulatory requirements have had the effect of reducing plant operability. This has had a negative impact on the ability of nuclear units to proactively respond to increased maneuvering requirements that accompany the increasing proportion of nuclear generation in the US. These regulations also place additional burdens on the operator. There are a variety of active programs in place to address the issue of improved operability and maneuverability. This paper discusses some backfit applications of advanced technology in the area of core monitoring and control for pressurized water reactors (PWRs). These have significantly increased the ability of the PWR to respond to grid transients while reducing the duties of the operating staff during such maneuvers.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 15455, 15464, 15870, 16039, 16040, 16914

15965 **(CONF-860911—27) Downstream behavior of fission products.** Johnson, I.; Farahat, M.K.; Settle, J.L.; Johnson, C.E.; Ritzman, R. (Argonne National Lab., IL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004667.

From 192. American Chemical Society national meeting; Anaheim, CA, USA (7 Sep 1986).

The downstream behavior of fission products has been investigated by injecting mixtures of CsOH, CsI, and Te into a flowing steam/hydrogen stream and determining the physical and chemical changes that took place as the gaseous mixture flowed down a reaction duct on which a temperature gradient (1000° to 200°C) had been imposed. Deposition on the wall of the duct occurred by vapor condensation in the higher temperature regions and by aerosol deposition in the remainder of the duct. Reactions in the gas stream between CsOH and CsI and between CsOH and Te had an effect on the vapor condensation. The aerosol was characterized by the use of impingement tabs placed in the gas stream.

15966 (INIS-mf—10555, pp 25-32) **Present status of geological and geophysical work at selected nuclear power plant sites in Czechoslovakia.** Cidlinsky, K.; Simunek, P. (Geofyzika, N.P., Brno, Czechoslovakia; Energoprojekt, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

In the last three years geological methods were used in Czechoslovakia to study several potential and approved sites for the construction of nuclear power plants. In the Blahutovice locality (northern Moravia) large-scale geophysical measurements have been carried out since 1982 whose objective is to identify microbumps and to determine their foci in the surrounds of the future nuclear power plant construction site. Similar measurements are being prepared for other localities, namely in eastern Bohemia and in Kecerovce in eastern Slovakia. In other localities changes in the intensity of earthquakes are studied caused by the detailed geological and hydrogeological situation. (Z.M.).

15967 (INIS-mf—10555, pp 33-41) **Synthetic seismic shifts and prospects of application.** Juhasova, E. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Ustav Stavebnictva a Architektury). 1985. (In Slovak). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Synthetizing seismic accelerograms are ever more frequently being used in the design of highly important structures, among them also nuclear power plants. Experience has shown that the overall outlook of synthetizing accelerograms resembles recordings of natural seismicity. This has been proved on the example of the locality of the Mochovce nuclear power plant. The following data were used as input data for the synthetizing accelerogram: rock subgrade, the nearest epicentre of historical earthquakes at a distance of 30 to 50 km from the locality, seismic degree within the range of 6 to 7 degrees of the MCS scale. The spectra of seismic response were calculated for the frequency range 1 to 100 Hz. Data on microbumps of soil and on the effects of blasting on subgrade and structure vibrations were also used to obtain information on the character of the transfer of the seismic effect through the geological medium. (Z.M.).

15968 (INIS-mf—10555, pp 91-95) **Present state and prospects of calculation techniques of seismic engineering at Energoprojekt Praha.** Bartak, V. (Energoprojekt, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

With regard to the fairly low seismic activity in Czechoslovakia, earthquake parameters cannot be directly used for designing safe structures and technologies. Energoprojekt, being the general project designer of nuclear power plants in Czechoslovakia whose task it also is to select suitable construction sites, has a data bank of accelerograms of earthquakes in the world. Analogous accelerograms designed for the calculations of the dynamic stress of structures must be modified to suit local geological conditions, and the set of accelerograms must be thus completed with synthesized accelerograms which take into account not only geological effects but also the mechanism of the source of the earthquake and provide the possible courses of acceleration caused by distant earthquakes. Briefly described are mathematical methods which Energoprojekt plans to apply for the use of the accelerogram data bank. (Z.M.).

15969 **Radioactive and electron microscope analysis of effluent monitor sample lines.** Kowalski, J.F. (Duquesne Light Co.). *Transactions of the American Nuclear Society;* 53: 427-429(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Effluent air sampling at nuclear power plant often leads to the question "How representative is the sample of the effluent stream?" Samples from radiation monitors are typically obtained at great distances from the sample nozzle because of high background concerns under postulated accidents. Sample line plateout during normal effluent sampling becomes the major concern. A US Nuclear Regulatory Commission inspection raised a concern that monitors were not collecting representative samples per ANSI standard N13.1. A comprehensive 2-yr study at Beaver Valley was performed during normal effluent releases in two phases: 1) weekly charcoal and glass fiber filter samples were analyzed for radioactivity for 6 months, and 2) nuclepore membrane filter samples were analyzed by electron microscope for 4- and 6-h periods. A specially designed test nozzle was directly inserted into an effluent stream for comparison with the radiation monitor samples. Particle behavior characteristics can be determined during effluent releases using a simple test probe. While particle plateout was the major purpose of the study, other particle behavior characteristics were evident and equally as important. Particle travel through long sample lines can also lead to (a) agglomeration or the coagulation of smaller particles to form larger ones, (b) particle splitting or fracturing upon impact with the sample line interior walls, and (c) resuspension of large particles in sample lines.

15970 **Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation.** Malen, K. (Studsvik Energiteknik AB, Nykoping). pp 37-62 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

The release of tellurium (Te-132) and caesium (Cs-134 and Cs-137) from UO/sub 2/ fuel is analyzed. The basis for the analysis is the experimental results from the S176 series of experiments performed at Studsvik. It seems that the model developed earlier for release of iodine applies also to tellurium and caesium. The model assumes sweeping up of the species in question by moving grain

boundaries and subsequent release through grain boundary porosity. An interesting extra feature is deposition of tellurium at temperatures in the range 1500-2000 K believed to be due to condensation.

15971 **Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering.** Freeburn, H.R.; Pati, S.R. (Combustion Engineering, Inc., Nuclear Power Systems, Windsor, CT). pp 543-558 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

The trend in the light water reactor industry to higher discharge burnups of UO/sub 2/ fuel rods has initiated the modification of existing fuel rod models to better account for high burnup effects. The degree to which fission gas release from UO/sub 2/ fuel is enhanced at higher burnup is being addressed in the process. Fission gas release modeling should include the separation of the individual effects of thermal diffusion and any burnup enhancement on the release. Although some modelers have interpreted the Bellamy and Rich data on fission gas release from UO/sub 2/ fuel in this fashion, they have assumed that below about 1250°C the gas release is not temperature-dependent, and this has led them to predict a very strong burnup enhancement of gas release above 20 MWd/kgU. More recent data, however, suggest that an appreciable amount of fission gas is released by a thermal diffusion mechanism at even lower temperatures and will add to the fission gas released due to the temperature-independent mechanisms of knockout and recoil.

15972 **Effect of axial diffusional delays on the overall fission gas release.** Pedersen, N.K. (Exxon Nuclear Co., 2955 George Washington Way, Richland, WA). pp 315-320 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

In fission gas release modeling, it is normally assumed that any locally released gas mixes instantly and perfectly with other gases throughout the internal rod void volume. The present work investigates the consequences of the assumption that perfect mixing is dependent on diffusion, although the subassumption is maintained that pressure equilibrium is instantly achieved. In other words, when a burst of gas release occurs at any axial location, sufficient local accommodation takes place throughout the rod to eliminate any pressure gradients, but due to the narrowness of the passages through fuel cracks and fuel-cladding gap, concentration gradients may still prevail. Diffusion coefficients for the subsequent concentration equilibration are derived from classical theories. Application of one-dimensional diffusion theory is straightforward, but the lack of knowledge of the effective width of the axial passage introduces an uncertainty.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 15490, 15861, 15958, 15959, 15960, 16016, 16020, 16028, 16066, 16067, 16079, 16094, 16106, 16162, 16256

15973 **(CONF-860906—22) Time constants and feedback transfer functions of EBR-II [Experimental Breeder Reactor] subassembly types.** Grimm, K.N.; Meneghetti, D. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004994.

From Advances in reactor physics and safety meeting; Saratoga Springs, NY, USA (17 Sep 1986).

Time constants, feedback reactivity transfer functions and power coefficients are calculated for stereotypical subassemblies in the EBR-II reactor. These quantities are calculated from nodal reactivities obtained from a reactor kinetic code analysis for a step change in power. Due to the multiplicity of eigenvalues, there are several time constants for each nodal position in a subassembly. Compared with these calculated values are analytically derived values for the initial node of a given channel.

15974 **(CONF-860906—23) Comparisons of PRD [power-reactivity-decrements] components for various EBR-II configurations.** Meneghetti, D.; Kucera, D.A. (Argonne National Lab., IL (USA)). 19 Sep 1986. Contract W-31109-ENG-38. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004712.

From Advances in reactor physics and safety meeting; Saratoga Springs, NY, USA (17 Sep 1986).

Comparison of detailed calculations of contributions by region and component of the power-reactivity-decrements (PRD) for four differing loading configurations of the Experimental Breeder Reactor-II (EBR-II) are given. The linear components and Doppler components are calculated. The non-linear (primarily subassembly bowing) components are deduced by differences relative to measured total PRD values. Variations in linear components range from about 10% to as much as about 100% depending upon the component. The deduced non-linear components differ both in magnitude and sign as functions of reactor power. Effects of differing assumptions of the nature of the fuel-to-clad interactions upon the PRD components are also calculated.

15975 **(CONF-860908—39) An integrated plant-life extension program for EBR-II [Experimental Breeder Reactor].** King, R.W. (Argonne National Lab., Idaho Falls, ID (USA)). 1986. Contract W-31109-ENG-38. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004981.

From Operability of nuclear power systems in normal and adverse environments meeting; Albuquerque, NM, USA (29 Sep 1986).

An integrated plant-life extension program is being developed and implemented at EBR-II. The program plan has five primary areas of focus, and is structured to take advantage of inherent features of the liquid-metal-cooled reactor that give it potential for very long life. The program is centered around development and increased use of computer-based software systems for surveillance, diagnostics, prognostics, data handling, and knowledge transfer. Even though the program is only partially implemented, benefits are already being realized in the form of increased understanding of plant system status and performance due to development of diagnostic data-handling software for manipulation of plant sensor data, and improved force monitoring and protection of the remotely operated fuel handling system. The eventual integration of the elements of the program is a key feature that is expected to enhance the overall effectiveness of the program.

15976 **(CONF-860908—40) EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software.** Mott, J.E.; Radtke, W.H.; King, R.W. (Saratoga Engineering Consultants, Inc., San Jose, CA (USA); Argonne National Lab., Idaho Falls, ID (USA)). Feb 1986. Contract W-31109-ENG-38. 15p. NTIS, PC A02. File Number DE87004974.

From Operability of nuclear power systems in normal and adverse environments meeting; Albuquerque, NM, USA (29 Sep 1986).

The problem of most accurately determining the Experimental Breeder Reactor-II (EBR-II) reactor outlet temperature from currently available plant signals is investigated. Historically, the reactor outlet pipe was originally instrumented with 8 temperature sensors but, during 22 years of operation, all these instruments have failed except for one remaining thermocouple, and its output had recently become suspect. Using pattern recognition methods to compare values of 129 plant signals for similarities over a 7 month period spanning reconfiguration of the core and recalibration of many plant signals, it was determined that the remaining reactor outlet pipe thermocouple is still useful as an indicator of true mixed mean reactor outlet temperature. Application of this methodology to investigate one specific signal has automatically validated the vast majority of the 129 signals used for pattern recognition and also highlighted a few inconsistent signals for further investigation.

15977 **(CONF-860931—7) Breached pin performance in the EBR-II RBCB program.** Bottcher, J.H.; Lambert, J.D.B.; Lee, M.J.; Strain, R.V.; Ukai, S.; Nomura, S. (Argonne National Lab., IL (USA); Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). 1986. Contract W-31109-ENG-38. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004487.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The results of five recent RBCB tests show that fuel-sodium reaction does not greatly degrade the performance of $(UPu)O_2$ pins: cladding breaches tend to stabilize and not lose fuel, while reaction product at the surface only mildly increases fuel temperatures. A bundle of 19 high-burnup pins with three failures was operated successfully for 97 days and low-burnup pins with simulated defective upper welds were operated for 152 days without difficulty. Several midlife failures were tested for shorter time to study fuel-sodium reaction. Testing continues in order to characterize the long-term RBCB behavior of midlife failures.

15978 **(CONF-860931—12) Posttest examination results of recent treat tests on metal fuel.** Holland, J.W.; Wright, A.E.; Bauer, T.H.; Goldman, A.J.; Klickman, A.E.; Sevy, R.H. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 14p. NTIS MF A01; 2; GPO Dep. File Number DE87004998.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

A series of in-reactor transient tests is underway to study the characteristics of metal-alloy fuel during transient-overpower-without-scram conditions. The initial tests focused on determining the margin to cladding breach and the axial fuel motions that would mitigate the power excursion. The tests were conducted in flowing-sodium loops with uranium - 5% fissium EBR-II Mark-II driver fuel elements in the TREAT facility. Posttest examination of the tests evaluated fuel elongation in intact pins and postfailure fuel motion. Microscopic examination of the intact pins studied the nature and extent of fuel/cladding interaction, fuel melt fraction and mass distribution, and distribution of porosity. Eutectic penetration and failure of the cladding were also examined in the failed pins.

15979 **(CONF-860931—13) Experience with EBR-II [Experimental Breeder Reactor] driver fuel.** Seidel, B.R.; Porter, D.L.; Walters, L.C.; Hofman, G.L. (Argonne National Lab., Idaho Falls, ID (USA); Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004997.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The exceptional performance of Experimental Breeder Reactor-II (EBR-II) metallic driver fuel has been demonstrated by the irradiation of a large number of elements under steady-state, transient overpower, and loss-of-flow conditions. High burnup with high reliability has been achieved by a close coupling of element design and materials selection. Quantification of reliability has allowed full utilization of element lifetime. Improved design and duct materials currently under test are expected to increase the burnup from 8 to 14 at.%.

15980 **(CONF-861102—33) Thermal impact of Na_3(U/sub 1-y/Pu/sub y/)O_4 formation on a breached LMR fuel element.** Lee, M.J.; Strain, R.V.; Lambert, J.D.B.; Feldman, E.E.; Shibaraha, I. (Argonne National Lab., IL (USA); Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004965.

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Continuous reactor operation with a limited number of breached elements is highly desirable for plant availability and fuel cycle economy. There are, however, concerns about breached element behavior and associated operation consequences, that have not been addressed. These concerns are currently being investigated under the RBCB (Run-Beyond-Cladding-Breach) program in EBR-II, a program jointly sponsored by the US Department of Energy and the Power Reactor and Nuclear Fuel Development Corporation of Japan.

15981 **(CONF-861185—6) Preliminary LEU fuel cycle analyses for the Belgian BR2 reactor.** Deen, J.R.; Snelgrove, J.L. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004752.

From Reduced Enrichment for Research and Test Reactors (RERTR) program international meeting; Gatlinburg, TN, USA (3 Nov 1986).

Fuel cycle calculations have been performed with reference HEU fuel and LEU fuel using Cd wires or boron as burnable absorbers. The ^{235}U content in the LEU element has increased 20% to 480g compared to the reference HEU element. The number of fuel plates has remained unchanged while the fuel meat thickness has increased to 0.76 mm from 0.51 mm. The LEU meat density is 5.1 Mg U/m^3. The reference fuel cycle was a 31 element core operating at 56 MW with a 19.8 day cycle length and eight fresh elements loaded per cycle. Comparable fuel cycle characteristics can be achieved using the proposed LEU fuel element with either Cd wires or boron burnable absorbers. The neutron flux for E/sub n/ > 1 eV changes very little (<5%) in LEU relative to HEU cores. Thermal flux reductions are 5 to 10% in non-fueled positions, and 20 to 30% in fuel elements.

15982 **(CONF-861185—7) Thermal-hydraulic aspects of flow inversion in a research reactor.** Smith, R.S.; Woodruff, W.L. (Argonne National Lab., IL (USA)). Nov 1986. Contract W-31109-ENG-38. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004751.

From Reduced Enrichment for Research and Test Reactors (RERTR) program international meeting; Gatlinburg, TN, USA (3 Nov 1986).

PARET, a neutronics and thermal-hydraulics computer code, has been modified to account for natural convection in a reactor core. The code was then used to analyze the flow inversion that occurs in a reactor with heat removal by forced convection in the downward direction after a pump failure. Typical results are shown for a number of parameters. Research reactors normally operating much above ten MW are predicted to experience nucleate boiling in the event of a flow inversion. Comparison with experimental results from the Belgian BR2 reactor indicated general agreement although nucleate boiling that was analytically predicted was not noted in the BR2 data.

15983 **(HEDL-SA—3363-FP) The Solid Waste Transfer Pit an FFTF [Fast Flux Test Facility] station for fuel and reflector transfer.** Milewski, A.J.; Thomson, J.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 15 Nov 1985. Contract AC06-76FF02170. 12p. (CONF-860311—11). NTIS, PC A02. File Number DE87004087.

From Nuclear power plant maintenance meeting; Salt Lake City, UT, USA (23 Mar 1986).

This paper describes the design aspects of a proposed FFTF facility called the Solid Waste Transfer Pit (SWTP). This new facility will be used as a transfer station for reflectors and/or low decay heat fuel assemblies when movement from the Fuel Storage Facility for sodium removal and subsequent reprocessing is to be accomplished. The SWTP utilizes a shielded cell cover with an integral manually-operated gate valve for top loading of a transfer vessel. The cost-effective design discussed herein provides a practical approach using state-of-the-art concepts while assuring safe and reliable operation.

15984 **(HEDL-SA—3589-FP) Reactor cover gas monitoring at the Fast Flux Test Facility.** Bechtold, R.A.; Holt, F.E.; Meadows, G.E.; Schenter, R.E. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1986. Contract AC06-76FF02170. 15p. (CONF-8609227—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004432.

From IAEA specialists meeting on fast reactor cover gas purification; Richland, WA, USA (24 Sep 1986).

The Fast Flux Test Facility (FFTF) is a 400-megawatt (thermal) sodium-cooled reactor designed for irradiation testing of fuels, materials and components for LMRs. It is operated by the Westing-

house Hanford Company for the US Department of Energy on the government-owned Hanford reservation near Richland, Washington. The first 100-day operating cycle began in April 1982 and the eighth operating cycle was completed in July 1986. Argon is used as the cover gas for all sodium systems at the plant. A program for cover gas monitoring has been in effect since the start of sodium fill in 1978. The argon is supplied to the FFTF by a liquid argon Dewar System and used without further purification.

15985 **(IAEA-TECDOC—384) Technology and use of low power research reactors. Report of a consultants' meeting held in Beijing, China, 30 April-3 May 1985.** (International Atomic Energy Agency, Vienna (Austria)). Aug 1986. 171p. (CONF-8504286—). NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708.

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The report contains a summary of discussions and 10 papers presented at the Consultants' Meeting on the Technology and Use of Low Power Research Reactors organized by the IAEA and held in Beijing (China) during 30 April-3 May 1985. The following topics have been covered: reactor utilization in medicine and biology, in universities, for training, as a neutron source for radiography and some remarks on the safety of low power research reactors. A separate abstract was prepared for each paper presented at the meeting. Refs, figs and tabs.

15986 (IAEA-TECDOC—384, pp 21-35) **Zero power reactor SUR and its application.** Wesser, U. (Technische Univ. Berlin, Germany, F.R. Inst. fuer Kerntechnik). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

This low-power reactor, rated nominally at 100 milliwatts, has a cylindrical core of 26 cm in diameter and 24 cm high consisting of U/sub 3/O/sub 8/ powder in a polyethylene matrix. The fuel is 20 percent enriched and the critical mass about 700 g. The excess reactivity is about 3 mk. The reactivity is controlled by two cadmium sheets in addition to a back-up system that drops the inner reflector. The reactor has no active cooling system. Personnel costs include a supervisor and an operator. The reactor is used for training in Reactor Theory (including use of a neutron chopper), reactor kinetics, nuclear technology, reactor operations and for doctoral thesis research. 7 figs.

15987 (IAEA-TECDOC—384, pp 65-88) **Slowpoke-2: Laboratory reactor for neutron irradiation.** Jervis, R.E. (Toronto Univ., Ontario, Canada). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The Slowpoke is a small pool-type nuclear reactor designed for use in universities, hospitals and research centers. The reactor has a low critical mass of less than 1kg of HEU fuel. The AECL has recently developed LEU replacement fuel for these reactors. The reactor is controlled by a single Cd control rod which could cause licensing problems in some countries. Maximum excess reactivity is limited to 3.5mk. In regular use, 10,000 to 20,000 capsules can be irradiated per year yielding 250-350,000 data points in derived results. With an annual operating budget of US$80,000, the estimated cost per result obtained is in the order of US$0.20-$0.40, which is much lower than most instrumental trace analysis methods. Examples of recent uses include archeometry, biological sciences, chemistry, earth sciences, environmental science, medicine, metallurgy, and industrial uses. The greatest number of irradiations are performed at 2kW. Forty nine percent of irradiations are for less than 1 minute and 44 percent for 1-10 minutes. The reactor has experienced less than one system malfunction per 3 reactor years. 7 refs, 4 figs, 4 tabs.

15988 (IAEA-TECDOC—384, pp 89-98) **MNSR Reactor.** Zhou Yongmao. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

This tank-in-pool reactor is based on the same design concept as the Canadian Slowpoke. The core is a right circular cylinder, 24 cm diameter by 25 cm long, containing 411 fuel pin positions. The pins are HEU-Aluminium alloy, 0.5 cm in diameter. Critical mass is about 900 g. The reactor has a single cadmium control rod. The back-up shutdown system is the insertion of a cadmium capsule in a core position. Excess reactivity is limited to 3.5mk. In both the MNSR and Slowpoke, the insertion of the maximum excess reactivity results in a power transient limited by the coolant/moderator temperature to safe values, independent of any operator action. This reactor is used primarily in training and neutron activation analysis. Up to 64 elements have been analyzed in a great variety of different disciplines. 4 figs.

15989 (IAEA-TECDOC—384, pp 103-114) **Application of the Miniature Neutron Source Reactor.** Wang Liyu. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The Miniature Neutron Source Reactor, built by the Institute of Atomic Energy, operates at a maximum power of 27 kW and a maximum available flux of 1 x 10/sup 12/ n/cm/sup 2/s/sup -1/. It is used primarily for activation analysis in a large number of fields - medicine, foods, geology, environment, industry, etc. Over 1500 different samples have been analysed. The majority of samples are irradiated between 1 and 10 minutes in a flux of 4 x 10/sup 11/ n/cm/sup 2/s/sup -1/. The gamma spectra are analysed using a locally developed software package called the SPAN on a PDP-11/34 computer. 5 figs, 8 tabs.

15990 (IAEA-TECDOC—384, pp 115-116) **MNSR - A satisfactory tool for training and teaching.** Guo Chengzhan. (Academia Sinica, Beijing, BJ, China. Inst. of Atomic Energy). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

15991 (IAEA-TECDOC—384, pp 117-126) **Operation and utilization of the Argonaut type low flux reactor.** Meulemeester, F.M. de. (Netherlands Energy Research Foundation, Petten). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The Low Flux Reactor (LFR) is in operation since 1960. Until 1983 the maximum power level has been 10 kW. In order to perform irradiations and experiments at higher neutron fluences, the power level was increased to 30 kW in 1983. In connection with the power upgrading several modifications to the reactor installation were necessary. The LFR is utilized for: (a) thermal neutron activation analysis, by means of a fast rabbit system, in combination with semi-automatic spectrometry equipment, (b) fast neutron effect studies on a.o. biological specimens by means of a thermal-to-fast neutron converter system, (c) neutron radiography development studies by means of a neutron radiography collimator and exposure system, suited for the "direct" method (gadolinium foil), (d) training and education purposes. In view of its favourable neutron-gamma ratio future utilization of the LFR for neutron capture-gamma ray spectrometry studies is being considered. 7 refs, 8 figs.

15992 (IAEA-TECDOC—384, pp 127-154) **Some experience with operation and use of a training reactor.** Levai, F.; Csom, G. (Budapesti Mueszaki Egyetem, Hungary). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

This reactor was originally designed for 10kW and upgraded to 100kW in 1980. It is a pool-type reactor with a primary and secondary cooling circuit utilizing EK-10 cylindrical rod fuel of UO/sub 2/ with enrichment of 20 percent. This design is similar to

other reactors operating up to 2MW. The experimental facilities include five horizontal beam tubes, a large tunnel usable as a thermal column, vertical in-core and reflector irradiation positions and a pneumatic transfer system. The staff for the training center consists of about 50 people responsible for the operation, maintenance, repair and utilization of the reactor. The reactor is used primarily for training university and outside personnel but is also used for research, non-destructive testing, neutron radiography and development of nuclear radiation instrumentation. Its low neutron flux, however, does not permit neutron diffraction or scattering activities. 23 refs, 11 figs.

15993 (IAEA-TECDOC—384, pp 155-170) **Training on Siloette reactor and associated simulators at the Grenoble Nuclear Research Centre.** Destot, M. (CEA Centre d'Etudes Nucleaires de Grenoble, 38, France). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The Siloette is a plate-type pool reactor designed to train engineers and technicians for positions in the nuclear power programme. The reactor also serves as a mock-up for experiments to be conducted in the larger Siloe (35MW) and Melusine (8MW) reactors. Its beam tubes are also useful for applications in neutron radiography. The number of trainees attending courses at this reactor has increased from 165 in 1975 to 650 (expected) in 1985. Most courses last from one to three weeks. Training on the Siloette reactor is augmented by a number of nuclear power plant simulators. Compact simulators for both PWRs and GCRs are installed.

15994 (IAEA-TECDOC—384, pp 37-63) **Applications of a low power nuclear reactor.** Blotcky, A.J. (Veterans Administration Medical Center, Omaha, NE, USA). Aug 1986. NTIS (US Sales Only), PC A08/MF A01. File Number DE87700708. (CONF-8504286—).

From Consultants' meeting on the technology and use of low power research reactors; Beijing, China (30 Apr 1985).

The Omaha Nebraska Veterans Administration Medical Center (OVAMC) TRIGA reactor is a research reactor designed and fabricated by General Atomic. The reactor first achieved criticality on June 30, 1959. It is a below grade, open-tank-type, ligh water moderated, cooled, and shielded reactor that currently is authorized to operate in the steady-state mode at thermal power levels up to 18KW with an excess reactivity limitation of 0.79% Delta K/K. 18 refs, 9 figs, 3 tabs.

15995 **(JINR—13-85-795) Investigation of pattern recognition algorithm to classify the IBR-2 reactor noise spectra.** Pepelyshev, Yu.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700769.

The possibility of application of ISODATA heuristic algorithm of pattern recognition to classify the IBR-2 noise power spectra is considered. The individual procedures of full pattern recognition algorithm, including the method of obtaining spectral evaluations, formalised algorithm of information spectra sign choice, and the possibility of getting the algorithm optimum parameters are examined. Selection of reactor power noises measured at different reactor states was taken as an example. it is shown that parameter optimization carried out at different stages of processing, permits to decrease by more than an order the volume of initial information and to increase the number of simultaneously processed spectra up to 3x10/sup 3/. In the range of the reactor mean power W(0.16 upto 1 MW) and coolant flow rate through the reactor core G(26 upto 80 m/sup 3/ per hour) the type of IBR-2 noise power is determined by W, G values and by the intensity of the moving reflector oscillations. The property of the reactor noises indicated may be applied to the reactor state diagnosis. 3 refs.; 4 figs.; 2 tabs.

15996 **FFTF fuel rotation for extended burnup.** Bennett, C.L. (Westinghouse Hanford Co., Richland, WA). *Transactions of the American Nuclear Society;* **53**: 90-92(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The standard driver fuel assemblies for the Fast Flux Test Facility (FFTF) reactor are hexagonally shaped components, 11.976 cm (4.715 in.) across outside load pad flats and 3.66 m (12 ft) long. The assembly is composed of a bundle of 217 fuel pins, 0.584-cm (0.230-in.) o.d., containing mixed oxide (PuO_2-UO_2) pellets; a surrounding duct and lower and upper end hardware. The hexagonally shaped FFTF driver fuel assembly can be positioned within a given core location in any one of six possible orientations. This paper describes how rotation or reorientation of outer fuel in the core provides additional margin for extended burnup. The implementation of this rotation plan is now well under way at the FFTF. Twenty-two driver fuel assemblies in rows 4, 5, and 6 were rotated during the cycle 7 refueling in August of 1985. The projected average peak pellet burnup reduction for these fuel assemblies was 8% as shown in Table I. FFTF Core Management plans to continue rotation of ~20 fuel assemblies per year - amounting to an annual cost savings of ~$400,000, based on saving the equivalent of one to two assemblies per year.

15997 **Remote weighing of irradiated fuel pins at FFTF.** Anglesey, M.O.; Romrell, D.M. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 491-492(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper describes the testing and operations of a remotely operated fuel pin weighing system developed to identify fuel pins with breached cladding in the interim examination and maintenance (IEM) cell at the Fast Flux Test Facility (FFTF) located near Richland, Washington. The IEM cell is a vertical hot cell located within the FFTF containment building that was designed for disassembly and reassembly of experiments and fuel assemblies.

15998 **Simulation of the Berkeley research reactor using DSNP.** DiPeso, G.J.; Ruby, L. (Univ. of California, Berkeley). *Transactions of the American Nuclear Society;* **53**: 48-49(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Preliminary results have been obtained from a simulation of the TRIGA Mark III Berkeley Research Reactor (BRR) using DSNP. The BRR utilizes fuel that is a mixture of zirconium hydride and uranium hydride, with a hydride-to-metal ratio of 1.65 and a ^{235}U enrichment of 28%. At Berkeley, version 3.4 of DSNP runs on an IBM 3081 Computer. The neutronic modules used to simulate the BRR were CNTRL1, NEUTR4, TPOWR4, CORTR4, and FDBEK4. The hydraulic loop consisted of modules LPLEN4, CORTR4, UPLEN4, PIPEUI, IHMXA1, and PIPEIL. As indicated from their names, several of the modules contained in library 1 were rewritten to incorporate a better model. The problem-description program was written to allow data entry from the console, and thus the FORTRAN program did not have to be recompiled for differing reactivity insertions. The decay heat module, GAMAR1, was not employed, since the ultimate objective of the simulation was to investigate operation of the reactor beyond its licensed limits.

15999 **Revitalization of reactor usage through reactor sharing.** Vernetson, W.G. (Univ. of Florida, Gainesville). *Transactions of the American Nuclear Society;* **53**: 60-62(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this work was to renew interest in using the University Florida Training Reactor (UFTR) for educational and training purposes outside the Nuclear Engineering Sciences (NES) and Environmental Engineering Sciences (EES) Departments at the University of Florida and for research by others outside the NES Department. The availability of the UFTR made possible through a US Department of Energy (DOE) Reactor Sharing Grant provided the mechanism to pursue generation of renewed interest at all levels both within the University of Florida and from other educational and corporate institutions.

16000 **Gamma analysis of soil at SEFOR, a decommissioned reactor.** West, L.; Talebizadeh, M.A. (Univ. of Arkansas, Fayetteville). *Transactions of the American Nuclear Society;* **53**: 165-166(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This is a work-in-progress report of a project to assay the soil for possible fission product contamination at the SEFOR site. SEFOR, the former Southwest Experimental Fast Oxide Reactor, was a cooperative program among a consortium of utilities, General Electric, the US Atomic Energy Commission, and others. The 20-MV(th) sodium-cooled test reactor operated between 1969 and 1972. After cessation of the experimental program, the facility was decommissioned into a mothball status. This work is a result of an effort to examine the site for possible contamination which might have resulted from either operating or decommissioning activities, such as flushing sodium barrels. Soil has been collected in over 25 locations in and around the SEFOR site. Although samples from the entire site have not been analyzed, the investigated areas are free of contamination.

16001 **Remote tool development at the interim examination and maintenance (IEM) cell.** Kalk, J.J. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* **53**: 510-511(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the interim examination and maintenance (IEM) cell at the Fast Flux Test Facility, radioactive fuel assemblies from the reactor are disassembled remotely for examination. The cell has an argon atmosphere and all of the equipment in the IEM cell must be either removed or worked on in place remotely for maintenance and repair. Equipment is mounted either on the cell walls or on other equipment with remote fasteners. These fasteners are required to be tightened to torque values ranging from 4 to 102 N m, and will be loosened and torqued several times during the lifetime of the cell. The purpose of this paper is to discuss the development philosophy for tools, specifically those relating to remote fasteners used in IEM cell work. The IEM cell fastener tightening system is now a series of wrenches and attachments instead of the one tool originally proposed. This set of tools allows use of relatively inexpensive commercially available equipment to tighten remote fasteners, while giving the cell operators the flexibility to use the tool they fell is best for the job. If the first choice is not available, use of an optional tool is possible with no loss of torque accuracy.

16002 **Robotic system for remote maintenance of a pulsed nuclear reactor.** Thunborg, S. (Sandia National Labs., Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 511-512(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Guidelines recently established for occupational radiation exposure specify that exposure should be as low as reasonably achievable. In conformance with these guidelines, SNL has developed a remote maintenance robot (RMR) system for use in the Sandia Pulse Reactor III (SPR III) facility. The RMR should reduce occupational radiation exposure by a factor of 4 and decrease reactor downtime. Other goals include developing a technology base for a more advanced pulse reactor and for the nuclear fuel cycle programs of the US Department of Energy and US Nuclear Regulatory Commission. The RMR has five major subsystems: (a) a chain-driven cart to bring the system into the reactor room; (b) a Puma 560 robot to perform dextrous operations; (c) a programmable turntable to orient the robot to any of the reactor's four sides; (d) a programmable overhead hoist for lifting components weighing up to 400 lb onto or off of the reactor; and (e) a supervisory control console for the system operator. Figure 1 is a schematic diagram of the turntable, hoist, and robot system in position around the SPR III reactor.

16003 **Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach.** Rhee, B.W.; Lim, I.C.; Chung, C.H. *Transactions of the American Nuclear Society;* **53**: 528-530(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the thermal-hydraulic (T/H) design of a reactor, several design bases are usually established at the outset and they serve throughout the design process as a set of fundamental criteria on which the adequacy of the thermal-hydraulic design can be judged. Some examples of these are the maximum fuel temperature design bases (DB), departure from nucleate boiling (DNB) BD, and maximum linear heat generation rate DB for pressurized water reactors. The same line of design approach was adopted to design the Korean Multipurpose Research Reactor to be built in the Korean Advanced Energy Research Institute by the end of 1990. The most stringent design basis for T/H design is found to be the onset of nucleate boiling (ONB) margin which is defined as the difference between the ONB wall temperature and the actual wall temperature at the hottest spot in the core. The main objective of this study is to identify what kinds of uncertainties are to be included in the core thermal-margin calculation, to set up a core thermal-margin calculation procedure into which these uncertainty effects are implemented, and to model and quantify their effects on the safety margin. The hot channel factor method for three-dimensional core thermal analysis proposed by Chelemer was used with COBRA-IV-I as the mathematical tool to evaluate the core thermal margin and its sensitivity on these uncertainties.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 15394, 15456, 15490, 15491, 15492, 15493, 15494, 15495, 15496, 15497, 15498, 15500, 15501, 15502, 15504, 15505, 15506, 15507, 15508, 15509, 15510, 15512, 15517, 15518, 15520, 15522, 15523, 15526, 15535, 15536, 15542, 15543, 15545, 15890, 16161, 16454, 16455, 16598, 16769, 17635, 17644

16004 **(BNL-NUREG—39048) Quasar uncertainty study.** Khatib-Rahbar, M.; Park, C.; Davis, R.; Nourbakhsh, H.; Lee, M.; Cazzoli, E.; Schmidt, E. (Brookhaven National Lab., Upton, NY (USA)). Oct 1986. Contract AC02-76CH00016. 8p. (CONF-8610135—49). NTIS, PC A02/MF A01 - GPO; GPO Dep. File Number TI87004603.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

Over the last decade, substantial development and progress has been made in the understanding of the nature of severe accidents and associated fission product release and transport. As part of this continuing effort, the United States Nuclear Regulatory Commission (USNRC) sponsored the development of the Source Term Code Package (STCP), which models core degradation, fission product release from the damaged fuel, and the subsequent migration of the fission products from the primary system to the containment and finally to the environment. The objectives of the QUASAR (Quantification and Uncertainty Analysis of Source Terms for Severe Accidents in Light Water Reactors) program are: (1) to address the uncertainties associated with input parameters and phenomenological models used in the STCP; and (2) to define reasonable and technically defensible parameter ranges and modelling assumptions for the use in the STCP. The uncertainties in the radiological releases to the environment can be defined as the degree of current knowledge associated with the magnitude, the timing, duration, and other pertinent characteristics of the release following a severe nuclear reactor accident. These uncertainties can be quantified by probability density functions (PDF) using the Source Term Code Package as the physical model. An attempt will also be made to address the phenomenological issues not adequately modeled by the STCP, using more advanced, mechanistic models.

16005 **(BNL-NUREG—39156) SSI [soil-structure interactions] and structural benchmarks.** Philippacopoulos, A.J.; Miller, C.A.; Costantino, C.J.; Graves, H. (Brookhaven National Lab., Upton, NY (USA); Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). 1986. Contract AC02-76CH00016. 13p. (CONF-8610135—57). NTIS, PC A02/MF A01 - GPO. File Number TI87005242.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

This paper presents the latest results of the ongoing program entitled, "Standard Problems for Structural Computer Codes", currently being worked on at BNL for the USNRC, Office of Nuclear

Regulatory Research. During FY 1986, efforts were focussed on three tasks, namely, (1) an investigation of ground water effects on the response of Category I structures, (2) the Soil-Structure Interaction Workshop and (3) studies on structural benchmarks associated with Category I structures. The objective of the studies on ground water effects is to verify the applicability and the limitations of the SSI methods currently used by the industry in performing seismic evaluations of nuclear plants which are located at sites with high water tables. In a previous study by BNL (NUREG/CR-4588), it has been concluded that the pore water can influence significantly the soil-structure interaction process. This result, however, is based on the assumption of fully saturated soil profiles. Consequently, the work was further extended to include cases associated with variable water table depths. In this paper, results related to "cut-off" depths beyond which the pore water effects can be ignored in seismic calculations, are addressed. Comprehensive numerical data are given for soil configurations typical to those encountered in nuclear plant sites. These data were generated by using a modified version of the SLAM code which is capable of handling problems related to the dynamic response of saturated soils.

16006 **(BNL-NUREG—39157) Synthesizing seismic fragility of components by use of existing data.** Bandyopadhyay, K.K.; Hofmayer, C.H. (Brookhaven National Lab., Upton, NY (USA)). 27 Oct 1986. Contract AC02-76CH00016. 5p. (CONF-8610135—58). NTIS, PC A02/MF A01 - GPO. File Number TI87005245.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

Brookhaven National Laboratory has completed Phase I of the Component Fragility Program and is now performing Phase II. The results of Phase I have been published in NUREG/CR-4659. In both Phases, existing test data for various models are utilized to determine the seismic fragilities of different equipment categories. This represents the first large scale attempt to assemble, compile and interpret the very large heretofore fragmented data base. In Phase I, a methodology has been established to compile the test data for variations of testing methods, vibration inputs, damping values, etc. Test response spectra have been used as a measure of the test vibration inputs. Fragility data have been collected and stored in a computerized data bank at BNL for many electrical and control equipment pieces. The data for Motor Control Centers (MCC) and Switchgears have been analyzed in Phase I for determination of the respective fragility levels. Additional test data are being collected in Phase II for these two equipment pieces, as well as other equipment categories. Statistical analyses are also being performed to estimate a single fragility descriptor for each equipment family.

16007 **(CEA-CONF—8343) Calculation RTGV.** Gonzalez, R. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). 1985. 27p. (In French). (CONF-8311295—6). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750441.

From RELAP TRAC seminar; Fontenay-aux-Roses, France (15 Nov 1983).

This paper presents the results (curves) obtained from the RELAP4-MOD6 code in the case of failure of a steam generator tube. A sensitivity study of mesh generation on physical phenomena is developed. It points out a bad estimation of the emergency injection time and of the period until the break flow stops.

16008 **(CEA-CONF—8348) PKL.** Probst, P.; Szabo, I. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). 1985. 66p. (In French). (CONF-8311295—7). NTIS (US Sales Only), PC A04/MF A01. File Number DE87750442.

From RELAP TRAC seminar; Fontenay-aux-Roses, France (15 Nov 1983).

This study concerns the simulation of the behavior of a PWR during a LOCA. One studies more particularly the refilling and reflooding phase (PKLI) and the end of the depressurization phase (PKLII). The aim of this test program is to provide the information needed for the validation/verification of computer codes (RELAP4 MOD6, TRAC PF1) and to test an instrumentation realized for the 2D/3D program. A comparison calculation/experiment is presented. 5 refs.

16009 (CONF-860203—, pp 69-78) **Establishing a comprehensive cost-effective radiological protection program for decommissioning project.** Maan, M.A.; Nair, R.P.; Schafer, S. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

With over 30 years of experience in designing and operating nuclear reactors, AECL has undertaken a new challenge, that of decommissioning a prototype nuclear power plant. The conversion of Gentilly-1 from an operational plant to a waste storage facility involved a transfer of irradiated fuel from wet to dry (canister) storage, and an extensive decontamination effort intended to ensure safe passive storage conditions, requiring only minimal surveillance. The program has been severely constrained by the imposition of a two-year schedule and a ceiling on expenditures for completion of the task. The constraints so defined made the requirement for cost-effectiveness mandatory. Yet, because of the commitment to excellence, the radiological protection program was to run its course without any compromises on safety standards, and with keeping the latest ICRP recommendations, on ALARA risk control, in mind. The logic in establishing the program, radiation protection organization, responsibilities and staffing and the personnel selection, training and qualification program are described. The dose control and ALARA program and the health physics facilities and equipment are discussed. Also covered are the experience with field execution of the program, a description of the development of procedures, quality assurance, and health physics interaction with the project. Finally the organization of the project and the subject of management oversight analytic trees are examined.

16010 (CONF-860203—, pp 253-260) **Post-accident recovery operations at TMI-2.** Merchant, D.J.; Tarpinian, J.E. (GPU Nuclear Corp., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The accident at Three Mile Island Unit 2 resulted in severe radiological conditions in many areas of the station. Personnel entry into some of these areas was required for plant stabilization and radwaste management although the radiation levels were extraordinarily high. At the time of the accident remotely operated equipment was not immediately available that could perform the required tasks in lieu of manned entries. Because of the plant layout, physical constraints, and required versatility, the type of remote equipment needed would have been extremely sophisticated. In fact, attempts were made to find equipment to do this work but none was found that possessed the required level of sophistication or versatility. Personnel radiation exposures may have been significantly reduced had such devices been available for immediate use and designed to perform the necessary tasks. This paper reviews the immediate post-accident recovery tasks with a perspective on the functional criteria for the development of remotely operated equipment which could be used in similar circumstances in the future. Also, recommendations are made for the possible development of plant installed equipment which could be designed to be compatible with remote equipment operations and thus reduce the degree of sophistication needed.

16011 (CONF-860203—, pp 261-270) **Implication of remote technology for decontamination activities.** Kniazewycz, B.G.; Irving, J.T.; Long, D.C.; Wagoner, H. (KLM Technologies, Inc., Walnut Creek, CA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The use of robotics or remote technologies to remove man from hostile environments has long been a driving objective for technology development within the nuclear power industry. The Niagara Mohawk Power Corporation (NMPC) Nine Mile Point

Nuclear Station is taking an organized approach to integrating remote technology into routine decontamination activities, nonprocessed radioactive waste disposal and special decontamination projects. Preliminary tests of an underwater robotic device for scrubbing and vacuuming was conducted at Nine Mile Point Unit 1 (NMP-1). The results of the test successfully provided proof of concept and identified improvements which would render the device acceptable for nuclear power station applications. Niagara Mohawk Power Corporation is undergoing a major radwaste retrofit project involving almost the entire Radwaste Building at NMP-1. The pre-demolition decontamination scenario was determined to be beneficial at reducing the project radiation exposure. Applications of remote technologies were identified to be cost beneficial for several project tasks including inspections, radiation survey mapping, debris sampling and removal, and video documentation. The purpose of this presentation is to discuss the remote technologies application program at Nine Mile Point and present in detail results of the projects mentioned.

16012 (CONF-860203—, pp 323-330) **Evaluation of use of the NNC Gamma-12 portal monitor for internal dosimetry screening during decommissioning.** Wilheim, G.; Youd, J. (Atomic Energy of Canada Ltd., Sheridan Park, Ontario). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The implementation of the Radiation Management Program, during decommissioning of Gentilly-1 NPP, includes a requirement to control occupational doses to ALARA levels. The target, to approach zero dose equivalent commitment due to internal uptakes, was perceived as realistic, provided the frequency of in-vivo monitoring of all personnel was sufficient to detect any problem early. The usual health physics control measures would require whole body counting which is both time consuming and expensive if carried out too frequently. An alternative solution has been found in using a portal monitor, with enhanced sensitivity, for pre-screening of personnel instead of whole-body counts. The National Nuclear Corporation Monitor, Model Gamma-12 was selected mainly for the sensitivity and flexibility, allowing fast processing of personnel being screened. In selecting this method, certain conditions had to be met; in particular, the composition of site main contaminants had to be reasonably well understood. Fortunately, decommissioning which involves a certain waiting period, allows for the decay of short lived radionuclides, hence leaving principally only a small number of long lived gamma emitters. Testing data is given, permitting the evaluation of the sensitivity of the monitor in internal mode and its potential in detecting doses related to the limits prescribed by regulatory agencies. In a final discussion, the advantages and constraints from using this method are presented. Depending on specific circumstances, the use of portal monitor for pre-screening of personnel was found both cost-effective as well as a reliable means of controlling the doses.

16013 (CONF-860203—, pp 369-378) **Fast sorting measurement technique to determine decontamination priority.** Distenfeld, C.H.; Brosey, B.; Igarashi, H. (GPU Nuclear Corp., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The method used to select decontamination priorities for the Three Mile Island Unit 2 (TMI-2) reactor building (RB) is systematic, but costs in personnel exposure and time must be borne. One way of minimizing exposure is to define and treat the one or two surface sources that are important contributors to the collective dose of the recovery personnel. Surface characteristics can then be determined and decontamination techniques developed to match the removal requirements. At TMI-2, a fast sorting technique was developed and used to prioritize surfaces for exposure reduction. A second quick sort can then be used to determine the next generation of surface characterization, decontamination method selection, and performance. The quick-sort method that was developed is based on the Eberline HP 220A probes directional survey system. The angular response of the HP 220A probes approaches 2 pi steradians and allows toward-away type measurements. Sources distributed over 4 pi steradians are hard to define with this system. Angular differentiation was improved to about pi/2 steradians by redesigning the probe shield. The change allows unambiguous six-direction measurements, such as up, down, front, rear, right, and left with practically no angular overlap or exclusion. A simple, lightweight stand was used to establish an angular reference for the rectangular packaged probe. The six surface planes of the rectangle work with the angular reference to establish the six viewing angles.

16014 (CONF-860501—17) **Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments.** Devolpi, A.; Doerner, R.C.; Fink, C.L.; Regis, J.P.; Rhodes, E.A.; Stanford, G.S.; Braid, T.H.; Boyar, R.E. (Argonne National Lab., IL (USA)). May 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02. File Number DE87001570.

From Conference on the science and technology of fast reactor safety; Channel Islands, UK (12 May 1986).

In all destructive fast-reactor safety experiments at TREAT, fuel motion and cladding failure have been monitored by the fast-neutron/gamma-ray hodoscope, providing experimental results that are directly applicable to design, modeling, and validation in fast-reactor safety. Hodoscope contributions to the safety program can be considered to fall into several groupings: pre-failure fuel motion, cladding failure, post-failure fuel motion, steel blockages, pretest and posttest radiography, axial-power-profile variations, and power-coupling monitoring. High-quality results in fuel motion have been achieved, and motion sequences have been reconstructed in qualitative and quantitative visual forms. A collimated detection system has been used to observe fission products in the upper regions of a test loop in the TREAT reactor. Particular regions of the loop are targeted through any of five channels in a rotatable assembly in a horizontal hole through the biological shield. A well-type neutron detector, optimized for delayed neutrons, and two GeLi gamma ray spectrometers have been used in several experiments. Data are presented showing a time history of the transport of Dn emitters, of gamma spectra identifying volatile fission products deposited as aerosols, and of fission gas isotopes released from the coolant.

16015 (CONF-860906—19) **Safety aspects of LMR [liquid metal-cooled reactor] core design.** Cahalan, J.E. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004979.

From Advances in reactor physics and safety meeting; Saratoga Springs, NY, USA (17 Sep 1986).

Features contributing to increased safety margins in liquid metal-cooled reactor (LMR) design are identified. The technical basis is presented for the performance of a pool-type reactor system with an advanced metallic alloy fuel in unprotected accidents. Results are presented from analyses of anticipated transients without scram, including loss-of-flow (LOF), transient overpower (TOP), and loss-of-heat-sink (LOHS) accidents.

16016 (CONF-860931—10) **Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel.** Seidel, B.R.; Batte, G.L.; Lahm, C.E.; Fryer, R.M.; Koenig, J.F.; Hofman, G.L. (Argonne National Lab., Idaho Falls, ID (USA); Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004978.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The off-normal performance of EBR-II Mark-II driver fuel has been more than satisfactory as demonstrated by robust reliability under repeated transient overpower and undercooled loss-of-flow tests, by benign run-beyond-cladding-breach behavior, and by forgiving response to fabrication defects including lack of bond. Test results have verified that the metallic driver fuel is very tolerant of off-normal events. This behavior has allowed EBR-II to operate in a combined steady-state and transient mode to provide test capability without limitation from the metallic driver fuel.

16017 (CONF-861204—5) Flow visualization study of inverted U-bend two-phase flow. Ishii, M.; Kim, S.B.; Lee, R. (Argonne National Lab., IL (USA); Korea Advanced Energy Research Inst., Seoul (Republic of Korea); Nuclear Regulatory Commission, Washington, DC (USA)). Dec 1986. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004706.

From 4. Miami international symposium on multi-phase transport and particulate phenomena; Miami Beach, FL, USA (15 Dec 1986).

A hot-leg U-bend experiment was performed. The experimental condition simulated the two-phase flow in a B and W primary loop during a small break loss of coolant accident or during some other abnormal transients. The loop design was based on the scaling criteria developed previously and the loop was operated either in a natural circulation mode or in a forced circulation mode using nitrogen gas and water. The two-phase flow regimes at the hot-leg were identified on the basis of visual observation. The phase separation at the top of the inverted U-bend was observed at low gas flow rate. The void fractions were measured using differential pressure transducers and compared with the prediction from the drift-flux model. The natural circulation flow interruption occurred in two different modes, namely, quasi-periodic and semi-permanent modes. This phenomenon is mainly dependent on the difference in the hydrostatic head in the riser and downcomer, and the flow regime at hot-leg. Besides this flow interruption phenomenon, dynamic flow instabilities of considerable amplitudes have been observed.

16018 (CONF-8610135—51) Simulation experiments for hot-leg U-bend two-phase flow phenomena. Ishii, M.; Hsu, J.T.; Tucholke, D.; Lambert, G.; Kataoka, I. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004958.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

In order to study the two-phase natural circulation and flow termination during a small break loss of coolant accident in LWR, simulation experiments have been performed. Based on the two-phase flow scaling criteria developed under this program, an adiabatic hot leg U-bend simulation loop using nitrogen gas and water and a Freon 113 boiling and condensation loop were built. The nitrogen-water system has been used to isolate key hydrodynamic phenomena from heat transfer problems, whereas the Freon loop has been used to study the effect of phase changes and fluid properties. Various tests were carried out to establish the basic mechanism of the flow termination and reestablishment as well as to obtain essential information on scale effects of parameters such as the loop frictional resistance, thermal center, U-bend curvature and inlet geometry. In addition to the above experimental study, a preliminary modeling study has been carried out for two-phase flow in a large vertical pipe at relatively low gas fluxes typical of natural circulation conditions.

16019 (CONF-8610135—54) Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments. Kot, C.A.; Srinivasan, M.G.; Hsieh, B.J.; Tang, Y.K.; Kassawara, R.P. (Argonne National Lab., IL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 31 Oct 1986. Contract W-31-109-ENG-38. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004937.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

The cooperative program between NRC/ANL and EPRI on the validation of soil-structure interaction analysis methods with actual seismic response data is described. A large scale-model of a containment building has been built by EPRI/Taipower in a highly seismic region of Taiwan. Vibration tests were performed, first on the basemat before the superstructure was built and then on the completed structure. Since its completion, the structure has experienced many earthquakes. The site and structural response to these earthquakes have been recorded with field (surface and downhole) and structural instrumentation. The validation program involves blind predictions of site and structural response during vibration tests and a selected seismic event, and subsequent comparison between the predictions and measurements. The predictive calculations are in progress. The results of the correlation are expected to lead to the evaluation of the methods as to their conservatisms and sensitivities.

16020 (CONF-8610135—56) HDR [Heissdampfreaktor] Phase 2 vibrational experiments. Malcher, L.; Kot, C.A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.); Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004985.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

As part of the second phase of vibrational/earthquake investigations at the HDR (Heissdampfreaktor) Test Facility in Kahl/Main, FRG, high-level shaker tests (SHAG) were performed during June and July 1986. The purpose of these experiments is to investigate full-scale structural response, soil-structure interaction, and piping and equipment response under strong excitation conditions. While global safety considerations imposed load limitations, the HDR soil/structure system was nevertheless tested to its capacity limits. The performance of up to seven different multiple support pipe hanger configurations (ranging from flexible to stiff systems) was evaluated in the tests. Data obtained in the tests serve to validate analysis methods.

16021 (CONF-8611109—3) Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions. Solyany, V.I.; Andreeva-Andrievskaya, L.N.; Bibilashvili, Yu.K.; Salatov, A.V.; Tonkov, V.Yu. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (USSR)). 1986. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87900498.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

The efficiency of provisions against accident situations at WWER NPP due to the depressurization of the primary circuit is in many respects dictated by the conditions of filling in the core from the system of emergency cooling. Therefore, it is important that the fuel clad ballooning in the process of an accident should not significantly block the flow area of fuel assemblies or critically impair their cooling. This paper discusses the influence of fuel clad straining on the blockage in WWER type assemblies and is a further evolution of investigations in this direction.

16022 (CONF-8611109—7) Fuel performance and fission product release during loss of coolant and severe fuel damage accidents. Sills, H.E.; Iglesias, F.C.; Fehrenbach, P.J.; Wood, J.C. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). 1986. 17p. NTIS (US Sales Only), PC A02. File Number DE87900501.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

This paper describes the results from out-pile tests to determine the reaction mechanics and kinetics controlling the oxidation of UO_2 at temperatures up to 1600°C. Our studies included the identification of reaction products formed as a function of temperature and oxidizing environment. Factors affecting the oxidative release of fission products from UO_2 and their subsequent transport and deposition were oxide stoichiometry, oxidation rate, grain growth, fragmentation, and the presence of Zircaloy. All-effects, in-pile tests will provide verification of fission product release at sheath temperatures from 1200 to 2500°C. The data we collect will describe the transport and deposition of fission products in the primary heat transport system, fuel element deformation, fuel/clad interaction and post-defect behavior. Additionally, we will accrue data supporting decontamination techniques following a severe fuel damage accident. Results of the LOCA test program are presented as well as the test sequence for the Blowdown Test Facility. The CANSIM suite of fuel performance models has been verified against extensive databases of in-pile results for normal and off-normal behavior respectively. CANSIM integrates fuel codes with

a transient, subchannel code to model the strong interaction between fuel assembly deformation and channel thermalhydraulics and thus simulate fuel element failure, fission product activity release and coolant flow blockage.

16023 **(CONF-8611109—9) PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C.** Hagen, S.; Hofmann, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Ingenieurtechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). 1986. 47p. NTIS (US Sales Only), PC A03. File Number DE87900493.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

Chemical interactions between UO_2 fuel and Zircaloy cladding up to 2350°C are described. UO_2/Zircaloy single effects tests have been performed with short LWR fuel rod segments in inert gas and under oxidizing conditions. The reaction kinetics of molten Zircaloy cladding with solid UO_2 fuel has been investigated with UO_2 crucibles containing molten Zircaloy. The UO_2/Zircaloy reactions obey parabolic rate laws. The oxygen uptake by solid Zircaloy due to chemical interaction with UO_2 occurs nearly as quickly as in reactions with steam or oxygen. To study the competing effects of external and internal cladding oxidation under realistic boundary conditions and the influence of uncontrolled temperature escalation due to the exothermic steam/Zircaloy reaction, single-rod and bundle experiments have been performed. Electrically heated fuel rod simulators, including absorber rod material (Ag, In, Cd alloy), guide tubes and grid spacers are used. The maximum measured cladding temperature during the temperature escalation was about 2200°C. The failure temperature of the absorber rods and the extent of bundle damage depends on the guide tube material (Zircaloy or stainless steel) and varies between 1200 and 1350°C. The molten materials and liquid reaction products can relocate and from large coherent lumps on solidification, which may result in complete blockage of the fuel rod bundle cross section. In the future, 7 x 7 bundle experiments of 2 m overall length will be performed in the new CORA facility to study, in addition, the influence of quenching on fuel rod integrity.

16024 **(EGG-M—25986) TMI-2 lower vessel debris examinations.** Akers, D.W.; Olsen, C.S.; Strain, R.V. (EG and G Idaho, Inc., Idaho Falls (USA); Argonne National Lab., IL (USA)). 17 Nov 1986. Contract AC07-76ID01570. 19p. (CONF-8610135—46). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004535.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

Samples of prior molten debris have been retrieved from the lower reactor head of the TMI-2 reactor. Preliminary results of the examination of these samples are presented with particular emphasis on the metallurgical and radiochemical characteristics of the materials. Areas of nearly pure fuel material in a stoichiometric, $(U,Zr)O_2$ matrix occurred which indicate temperatures approaching the melting point of UO_2 (up to 3100°K). Comparison of the measured radionuclide concentrations in the debris with ORIGEN-2 calculated concentrations indicates significant retention of Cs-137 (up to 22%) in the prior molten debris. Autoradiography results suggest significant accumulations of activity on the surfaces of voids in the debris and at grain boundaries.

16025 **(EGG-M—27686) Preliminary results of the TMI-2 core bores.** McCardell, R.K.; Tolman, E.L.; Martin, M.R.; Smith, R.P. (EG and G Idaho, Inc., Idaho Falls (USA)). 30 Oct 1986. Contract AC07-76ID01570. 21p. (CONF-8610135—47). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004534.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

This paper presents the core bore acquisition data available to date from the Department of Energy TMI-2 Sample Acquisition and Examination Program. Core bore samples have been recently acquired and video inspection of the lower core and core support regions have been completed via the core access holes. The data summarized in the paper include basic observations characterizing the lower region of the core, the core support assembly and lower plenum debris, and details showing how an end-state core configuration was estimated. Implications of the core bore acquisition data on the core damage are discussed in a companion paper also presented in the Conference.

16026 **(EGG-M—32686) Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating.** Adams, J.P.; Dobbe, C.A.; Bayless, P.D. (EG and G Idaho, Inc., Idaho Falls (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1986. Contract AC07-76ID01570. 22p. (CONF-861204—3). NTIS, PC A02 - GPO. File Number DE87004541.

From 4. Miami international symposium on multi-phase transport and particulate phenomena; Miami Beach, FL, USA (15 Dec 1986).

Calculations have been made of the response of pressurized water reactors (PWRs) during a small-break, loss-of-coolant accident with the reactor coolant pumps (RCPs) operating. This study was conducted, as part of a comprehensive project, to assess the relationship between measurable RCP parameters, such as motor power or current, and fluid density, both local (at the RCP inlet) and global (average reactor coolant system). Additionally, the efficacy of using these RCP parameters, together with fluid temperature, to identify an off-nominal transient as either a LOCA, a heatup transient, or a cooldown transient and to follow recovery from the transient was assessed. The RELAP4 and RELAP5 computer codes were used with three independent sets of RCP, two-phase degradation multipliers. These multipliers were based on data obtained in two-phase flow conditions for the Semiscale, LOFT, and Creare/Combustion Engineering (CE)/Electric Power Research Institute (EPRI) pumps, respectively. Two reference PWRs were used in this study: Zion, a four-loop, 1100-MWe, Westinghouse plant operated by Commonwealth Edison Co. in Zion, Illinois and Bellefonte, a two-by-four loop, 1213 MWe, Babcock and Wilcox designed plant being built by the Tennessee Valley Authority in Scottsboro, Alabama. The results from this study showed that RCP operation resulted in an approximately homogeneous reactor coolant system and that this result was independent of reference plant, computer code, or two-phase RCP head degradation multiplier used in the calculation.

16027 **(EGG-M—36186) Relocation of zircaloy-clad uranium dioxide under severe accident conditions.** Cook, B.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 7 Nov 1986. Contract AC07-76ID01570. 18p. (CONF-8611109—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004536.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

The mechanisms affecting the relocation of zircaloy-clad UO_2 fuel rods during severe accidents in pressurized water reactors are discussed. Results from two integral in-pile tests and from the damaged Three Mile Island Unit-2 reactor core are presented. The thermal hydraulic conditions that influence fuel relocation are identified and chemical interactions between the fuel and the control rod material are addressed as they relate to material relocation.

16028 **(EPRI-NP—4924-Vol.2) An approach to the verification of a fault-tolerant, computer-based reactor safety system: A case study using automated reasoning: Volume 2, Appendixes: Interim report.** Chisholm, G.H.; Kljaich, J.; Smith, B.T.; Wojcik, A.S. (Argonne National Lab., IL (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. Contract W-31109-ENG-38. 100p. NTIS, PC A05/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303; 1; GPO Dep. File Number DE87005443.

The purpose of this project is to explore the feasibility of automating the verification process for computer systems. The intent is to demonstrate that both the software and hardware that comprise the system meet specified availability and reliability criteria, that is, total design analysis. The approach to automation is based upon the use of Automated Reasoning Software developed at

Argonne National Laboratory. This approach is herein referred to as formal analysis and is based on previous work on the formal verification of digital hardware designs. Formal analysis represents a rigorous evaluation which is appropriate for system acceptance in critical applications, such as a Reactor Safety System (RSS). This report describes a formal analysis technique in the context of a case study, that is, demonstrates the feasibility of applying formal analysis via application. The case study described is based on the Reactor Safety System (RSS) for the Experimental Breeder Reactor-II (EBR-II). This is a system where high reliability and availability are tantamount to safety. The conceptual design for this case study incorporates a Fault-Tolerant Processor (FTP) for the computer environment. An FTP is a computer which has the ability to produce correct results even in the presence of any single fault. This technology was selected as it provides a computer-based equivalent to the traditional analog based RSSs. This provides a more conservative design constraint than that imposed by the IEEE Standard, Criteria For Protection Systems For Nuclear Power Generating Stations (ANSI N42.7-1972).

16029 **(EPRI-NP—4991) Application of the leak-before-break approach to BWR piping: Final report.** Mehta, H.S.; Patel, N.T.; Ranganath, S. (General Electric Co., San Jose, CA (USA). Nuclear Energy Business Operations; Electric Power Research Inst., Palo Alto, CA (USA)). Dec 1986. 115p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920221.

The work reported here consisted of several tasks. The first task dealt with the acceptance criteria for the LBB evaluations and the consideration of limitations in its application. NUREG-1061, Volume 3 recommendations formed the basis of the criteria developed in this task. The second task assigned priorities to BWR piping systems for LBB application based on the factors such as technical viability and cost versus benefits. In the third task, the LBB approach was applied to the recirculation system of a BWR-4 plant. Lastly, stress criteria were developed which a piping analyst could use as guidelines during snubber optimization analyses such that compliance of the piping system with the LBB criteria is reasonably assured.

16030 **(EPRI-NP—4999) Postaccident chemical decontamination: Method development: Final report.** Sjoeblom, R.; Olson, P.M.; Parke, J.M.; Schneidmiller, D. (Pacific Nuclear Services, Richland, WA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 168p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920222.

The objectives of this report are to refine the OPG-AP-CITROX process to maximize its effectiveness for decontamination while minimizing its waste disposal costs; to verify the effectiveness of the refined process using TMI-2 artifacts and fuel debris and to assess its corrosion effects on major TMI-2 construction materials.

16031 **(HSK-AN—1816) Chernobyl accident: An overview of causes and effects.** (Bundesamt fuer Energiewirtschaft, Wuerenlingen (Switzerland). Abt. fuer die Sicherheit der Kernanlagen). Oct 1986. 76p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87700700.

After a brief description of the Chernobyl reactor and the accident, the activity release is assessed. Radiological effects in the immediate vicinity as well as in Europe are discussed, with particular emphasis on Switzerland. Results concerning food contamination are presented. Protective measures are described and an overview of the radiation dose distribution is given. A comparison with the doses from natural radiation and weapons fallout is made.

16032 **(IAE—4118/3) Quenching rates in 7-rod bundle of zirconium alloy at emergency cooling parameters of WWER.** Zemlyanukhin, V.V.; Kabanov, L.P.; Makarovskij, P.L.; Martynova, A.A.; Mordashev, V.M.; Nikonov, S.P.; Rybakov, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1985. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700705.

On the out-of-pile loop the data on quenching rates in 7-rod bundle of WWER of zirconium alloy in the coolant mass rates range of 10-75 kg/(m/sup 2/xs), initial wall temptratures 600-1100 K, water subcooling at the inlet 5-80 K, specific power release 0-50 kW/m/sup 2/ and pressure 0.1 MPa are obtained. As a result of the analysis of experimental data the dependence for the growth of quenching rates in the rod bundle upon post-accident flooding from the bottom of the reactor core is obtained. The dependence is obtained on the base of method of approximation of many variable functions by superpositions of function sums of less number of variables. Substantial effect of the distance between spacers and their form on the quenching rates is proved. 11 refs.; 10 figs.; 1 tab.

16033 **(IAEA-TC—579-24) Research of LWR [light water reactor] fuel rod behaviour under accident conditions.** Pazdera, F.; Valach, M.; Vrtilkova, V. (Nuclear Research Inst., Rez (Czechoslovakia); Nuclear Fuel Inst., Zbraslav (Czechoslovakia)). 1986. 37p. (CONF-8611109—11). NTIS (US Sales Only), PC A03. File Number DE87900499.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

Recent results of theoretical and experimental research on light water reactor fuel rod behaviour under accident conditions are presented. Mechanical equation of state for Zr1Nb cladding alloy is proposed. The equation is compared with 19 tensile tests and 81 creep tests in the strain rate range 10^{-6} - 10^{-1} s^{-1} and temperature range 600 - 900°C. Comparison with experiments confirms both adequate description of steady state and transient loading. Verification of computer code FRAS for light water reactor fuel rod behaviour modelling under accident conditions was performed. Several examples are presented: comparison with published experiments on NSRR reactor; and calculation of WWER 440 fuel rod behaviour under LOCA conditions with and without subchannel thermohydraulics. A two dimensional code describing cladding deformation in r-z geometry was developed. Various deformation shapes are calculated for burst tests performed at constant temperature.

16034 **(IAEA-TC—579-31) Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme.** Mathiot, A.; Le Marois, G.; Warlop, R. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI); CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Div. de Metallurgie et d'Etude des Combustibles Nucleaires). 1986. 12p. (CONF-8611109—4). NTIS (US Sales Only), PC A02. File Number DE87900500.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

The NEVA experiments are part of the CEA.IPSN experimental program devoted to investigating fuel and fission product behavior during severe PWR accidents. The main objectives of the program are as follows: to simulate a defined accident sequence on a section of irradiated pin; to study qualitatively and quantitatively the kinetics of fission product release during the sequence; and to determine the physical and chemical characteristics of the species released. The experimental sequence for the first tests is as follows: temperature increase at a rate of 1°C x m^{-1} up to 1800°C in a mixed atmosphere of steam and hydrogen; stable temperature for 15 minutes; and slow cooling under helium sweeping.

16035 **(IAEA-TC—579/42) Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions.** Joshi, N.B.; Srinivasan, V.S.; Nanjundeswaran, K. (Tarapur Atomic Power Station (India)). 1986. 41p. (CONF-8611109—8). NTIS (US Sales Only), PC A03. File Number DE87900503.

From IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions; Vienna, Austria (10 Nov 1986).

Tarapur Atomic Power Station has accumulated over 33 reactor years of operating experience in monitoring Boiling Water Reactor fuel behavior. The sudden and sharp increases in the fission product releases were experienced in the earlier years due to gross fuel failures caused by mechanical damage (lifting of certain core

internals) or due to certain operating practices and transients. Data on fission product releases under such gross fuel failure conditions is presented and discussed with evaluation of the incident and corrective actions taken. An apparent correlation observed in incidents of fuel failures and certain operating system transients are discussed. Conventionally for the BWRs sum of six fission gas release rate measured at Steam Jet Air Ejectors is correlated with fission gas radiation monitor reading to work out alarm and trip settings - modifications are suggested to improve reliability and effectiveness in monitoring of fission gas release rates. Appropriate data for fission product deposition and characterization of coolant crud long lived fission products is also presented.

16036 (INIS-mf—10313) **Probabilistic safety analysis for Sizewell B - Proof of Evidence, established on behalf of the Friends of the Earth, London, within the framework of the Sizewell B Power Station Public Inquiry.** Hahn, L. (Institut fuer Angewandte Oekologie, Darmstadt (Germany, F.R.). Projektgruppe Reaktorsicherheit). Aug 1985. 200p. (In German, English). NTIS (US Sales Only), PC A09/MF A01. File Number DE87750499.

Werkstattreihe. No. 20.

The conclusions drawn in the study presented by the Oeko-Institut, Freiburg, state that there are indeed advantages in the design of the PWR-type Sizewell-B reactor over other types with regard to certain event sequences, but that on the whole, with regard to overall accident probability, there is no significant progress detectable, or even provable. The main results of the analysis in hand undoubtedly are that the unrealistically favourable data presented in the other two Sizewell studies are brought about not by the design features, but by the assumptions, methods and data applied in the studies, so that certain weak points in the methodological approach common to both studies inevitably lead to similar results. The authors of the study in hand explain some of the weak points of the Westinghouse Study and of the CEGB Study to be as follows: Lack of error bands of results. Lack of a quantitative analysis of in-plant fire accidents. Lack of quantitative analysis of external impacts. Lack of (CEGB) or unsatisfactory (Westinghouse) evaluation of the measuring, control, and drive systems. Lack of (CEGB) or unsatisfatory (Westinghouse) evaluation of the human factors. Completely unsatisfactory evaluation of common-mode failures (i.e. multiple failures due to common cause, undiscovered systems interactions, etc.). Unacceptable handling and use of available data (using data assessments made by experts, instead of data available from experience). (orig./HSCH).

16037 (INIS-mf—10524) **APTCARE - Lucas Heights. A plan to cope with accidents at the Research Establishment of the Australian Atomic Energy Commission, Lucas Heights, NSW.** (Australian Atomic Energy Commission Research Establishment, Lucas Heights. Local Liaison Working Party). May 1986. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701295.

Includes a background note by M.H. Brennan, Chairman, AAEC.

This plan details command co-ordination and support responses of Commonwealth and State Authorities in the event of an accident with offsite consequences at the Lucas Heights Research Laboratories. The plan has been prepared by the AAEC Local Liaison Working Party, comprising representatives of the Australian Atomic Energy Commission, NSW Police Department, NSW Board of Fire Commissioners, NSW State Emergency Services and Civil Defence Organisation, NSW Department of Health, NSW Department of Environment and Planning and Sutherland Shire Council.

16038 (INIS-mf—10555) **Safety and operating reliability of the WWER reactor. Seismic load.** Pecinka, L.; Hampala, O. (eds.). (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1985. 236p. (In Czech). (CONF-8410462—). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736.

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The proceedings contain 21 papers presented at the seminar held in Zelezna Ruda, Czechoslovakia, in October 1984. All papers fall under the INIS scope. (Z.M.).

16039 (INIS-mf—10555, pp 7-24) **Dynamic parameters of seismic waves and the seismic threat to a nuclear power plant site.** Schenk, V.; Schenkova, Z. (Ceskoslovenska Akademie Ved, Prague. Geofyzikalni Ustav). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The hypothetical maximum effects of the so-called operating basis earthquake and of the safe shutdown earthquake should be defined for expressing the seismic threat to dimensionally and structurally complex structures which include nuclear power plants. Next to the said variables it will be necessary to take into account accelerograms corresponding to the said two types of earthquake. The objective selection of analogous accelerograms for the two types of earthquake necessitates the comprehensive knowledge of seismic wave parameters in the vicinity of the earthquake and their dependence on the earthquake magnitude and the distance from the epicentre. Relations are given of these parameters and macroseismic intensity and briefly described are other parameters obtained by statistical processing of digitalized seismic wave records. (Z.M.).

16040 (INIS-mf—10555, pp 42-57) **Present state of earthquake resistance calculations for the main generating units of nuclear power plants Mochovce and Temelin.** David, M. (Energoprojekt, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The finite element method and the ICES program package were used for calculating the earthquake resistance of the main generating unit of the Mochovce nuclear power plant. The seismic calculation of structures includes the calculation of shapes and eigenfrequencies, the calculation of substitute seismic forces, of the dynamic response of structures to accelerogram excitation and the calculation of response spectra from accelerograms. Seismic calculations are being prepared for the Temelin nuclear power plant. The calculation method will be the same with different distribution of facilities and structures into categories of earthquake resistance. So far dynamic calculations have been made of the WWER-1000 reactor containment on a simplified model; the calculation of a spatial model is being prepared which will take account of the fact that the containment is part of a complex structure. (Z.M.).

16041 (INIS-mf—10555, pp 58-69) **Earthquake resistance problems of primary circuit components.** Pecinka, L. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The resistance of primary circuit components to failures caused by a seismic event in the locality of a nuclear power plant is demonstrated by test calculations in two stages: at the project design stage and at the stage of writing the preliminary safety report. In the first stage, attention is devoted mainly to the reactor, the primary circuit pipes, the main closing valves and the pipes of the main circulating pump circuit. Such factors are studied as is the antiseismic positioning of the reactor pressure vessel and the resistance of the reactor internals to plastic deformations. In the second stage, the test calculations are extended to the active and passive safety systems of the primary circuit and to the behviour of the reactor core. The response surface method is recommended for assessing the effect of uncertainty which burdens the calculation of the seismic response of pipings. The method will be used in the preliminary safety report for the Temelin nuclear power plant. (Z.M.).

16042 (INIS-mf—10555, pp 70-90) **Earthquake resistance problems of electric equipment.** Masopust, R. (Skoda, Plzen, Czechoslovakia. Zavod Vystavba Jadernych Elektraren). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Earthquake resistance of electric equipment of nuclear power plants is assessed by calculation, this in cases where it is possible to easily model the assessed equipment on a mechanical system. If this is not so it will be necessary to make experimental verifications, this either by proof testing for equipment designed for single use or by fragility testing of standard equipment. Briefly discussed are the specificities of evaluating earthquake resistance of electric equipment of nuclear power plants according to regulations valid in western countries and in the USSR. In Czechoslovakia there is no legal standard for such testing and therefore the Soviet experience is of special value, mainly because the reactor type is the same and also with respect to the experimental equipment available. (Z.M.).

16043 (INIS-mf—10555, pp 115-121) **Transverse vibration of beam with beats, induced by seismic excitation.** Peterka, F.; Vacik, J. (Ceskoslovenska Akademie Ved, Prague. Ustav Termomechaniky; Ceskoslovenska Akademie Ved, Prague. Ustav Teorie Informace a Automatizace). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

One of the problems of the earthquake resistance of the primary circuit of nuclear power plants is the transverse vibration of fuel elements with the possibility of the occurrence of beats. In WWER-440 reactors, fuel rod bundles may thus vibrate relative to the hexagonal covering, and entire fuel elements relative to the core basket. A mathematical model of a beam of constant cross-section was therefore constructed substituting for the said parts of the reactor. The continuous beam was substituted with a five-mass mechanical model for the purposes of the calculation. The motion system was modelled on an analog computer. The results show that the maximum transverse displacement of the fuel element is 0.8 mm and that the fuel element will not impact onto the core basket. Inside the fuel element 150 beats will occur during a seismic event lasting 6 seconds, with the centre of the fuel rod bundle having the most frequent impacts. (Z.M.).

16044 (INIS-mf—10555, pp 152-166) **Effect of extreme forces on structures and equipment of nuclear power plants.** Masopust, R. (Skoda, Plzen, Czechoslovakia. Zavod Vystavba Jadernych Elektraren). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

An analysis is made of extreme effects on nuclear power plants, i.e., effects of forces of nature, effects caused by extraneous human activity and effects arising inside the nuclear power plant which may cause accidents threatening nuclear safety. These are unplanned events whose occurrence is expected with a probability of less that 10/sup -1/year and higher than 10/sup -6/ to 10/sup -7/ year. The theory and practice of nuclear power plant project designing devote almost no attention to such events, with the exception of earthquakes. The basic classification is presented of these effects according to valid regulations in the USA, the USSR and the FRG and also under IAEA regulations. A detailed analysis is also made of extreme effects on the structures and equipment of nuclear power plants in Czechoslovak conditions. (Z.M.).

16045 (INIS-mf—10555, pp 173-183) **Dynamic response of nuclear power plant generating unit at simulated seismic excitation.** Rejf, P.; Konstantinidis, S. (Statni Vyzkumny Ustav pro Stavbu Stroju, Bechovice, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Three synchronized Vibroseis generators placed outside the reactor building were used to simulate seismic effects on the generating unit of the Dykovany nuclear power plant. The excitation force showed a sine waveform with a continuously changing frequency. The vibrations were transmitted to the pressure vessel via the subgrade and the reinforced concrete foundations. The measured data show the relation between the amplitude of induced vibrations of the pressure vessel and the magnitude of simulated seismic activity. This relationship may be used for determining the stress of various nuclear power plant equipment during an earthquake and for determining its earthquake resistance. The experiment also verified the suitability of used instruments, measuring methods and evaluation procedures. The measured values were used for deriving certain constants for mathematical models used in the calculation of structures. (Z.M.).

16046 (INIS-mf—10555, pp 184-193) **Problems of vibration of liquid in axially symmetric tanks.** Pecinka, L. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

A brief description is presented of the development of calculation and experimental methods aimed at identifying the behaviour of liquids in axially symmetric tanks. The methods serve the study of the response of such tanks filled with liquid, to the horizontal component of seismic acceleration of subgrade. Special attention is devoted to the application of the finite element method to the problems of flexible tanks. Suitable calculation methods are recommended for various components of WWER-440 and WWER-1000 reactors. (Z.M.).

16047 (INIS-mf—10555, pp 194-210) **Earthquake resistance of liquid-filled thin-walled cylindrical tanks.** Masopust, R.; Strunc, A. (Skoda, Plzen, Czechoslovakia. Zavod Vystavba Jadernych Elektraren). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Standard universal programs for finite element analysis of structures and systems appear to be the most suitable for the calculation of earthquake resistance of thin-walled cylindrical vessels filled with liquid. The mathematical model is described developed for these purposes by the SKODA enterprise. Actual calculations are made using program JD 75 S on a SM-4/20 minicomputer and comprise calculation of the maximum value of the hydrodynamic pulsed and convective pressure of the liquid in the tank. The JD 75 S program cooperates with the SAP IV program which is used for calculating eigenvibration of the empty tank and the static response to calculated maximum values of hydrodynamic pressures, including the inertial effect of the tank walls. This response is, within accepted assumptions, equivalent to the maximum dynamic response. (Z.M.).

16048 (INIS-mf—10555, pp 211-216) **Finite element calculation of dynamic behaviour of filled tanks.** Strunc, A. (Skoda, Plzen, Czechoslovakia. Zavod Vystavba Jadernych Elektraren). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The Lagrangian model was chosen by the SKODA enterprise for finite element calculations of the dynamic behaviour of tanks filled with liquid. An ideal non-viscous liquid is assumed and the pressure inside the liquid is described using a scalar potential field. Neither surface tension nor the energy of waves on the free surface of the liquid nor adhesive forces due to contact with the wall are considered. Energy radiation at the boundary of the discretized zone is not taken into account in the construction of the element. (Z.M.).

16049 (INIS-mf—10555, pp 217-226) **Vibration of liquid in partially filled horizontal channel.** Klatil, J.; Drabek, P. (Vysoka Skola Strojni a Elektrotechnicka, Plzen, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The integral was used for deriving theoretical relations for eigenfrequencies and vibration shapes of the free surface of the

liquid in a partly filled horizontal circular channel. Ideally tough channel walls are assumed, as is a non-viscous and incompressible liquid. Relations are derived for the first eigenfrequency, this for three cases of channel filling: the channel is half filled, almost full and almost empty. (Z.M.).

16050 (INIS-mf—10555, pp 227-234) **Effects of liquid on partially filled tanks - numerical results.** Cechura, M. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The problem is analysed of eigenvalue in calculating the effect of vibration of the liquid on a partially filled tank. Some numerical results of the calculation of vibration shape and force from the motion of the liquid are presented graphically. (Z.M.).

16051 (INIS-mf—10555, pp 96-106) **Mathematical model for calculating seismic response of type V 213-C reactor.** Zeman, V. (Vysoka Skola Strojni a Elektrotechnicka, Plzen, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Earthquake resistance of the reactor may be assessed on the basis of an analysis of seismic response. The method of spectral response appears to be advantageous. A mathematical model is described of the WWER-440 reactor which expresses separately the horizontal and vertical components of motions. The structure of the mathematical model allows to aproximately model the vibration of components by neglecting deformations of tougher subsystems and to modify the model for structural modifications of the reactor. The SEIZMO program is used for the numerical calculation of the earthquake resistance of the reactor. The program was experimentally used for resolving the seismic response of the upper block of the reactor. (Z.M.).

16052 (INIS-mf—10555, pp 107-114) **Physics modelling of reactor V 213-C seismic response.** Petrovsky, V.; Brynich, J. (Skoda, Plzen, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

A reduced physical model of organic glass to the scale 1:12 was produced for determining the dynamic response of the WWER-440 reactor to seismic excitation. All anti-seismic elements are easily removable and an extensive experimental program is prepared for the determination of dynamic properties and responses of the reactor model as a dynamic system with many degrees of freedom. In the first stage, the model will be subjected to kinematic excitation by pulses of suitable magnitude, shape and duration and the frequency characteristics will be identified. In the second stage, eigenfrequencies in various frequency ranges will be determined. In the third stage, the non-periodical response will be measured at various points of the model to simulated earthquake according to the selected accelerogram. (Z.M.).

16053 (INIS-mf—10555, pp 122-135) **Seismic load calculation for primary circuit of Dukovany Nuclear Power Plant.** Voborsky, J. (Statni Vyzkumny Ustav pro Stavbu Stroju, Bechovice, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

A complex seismic analysis was made of the pipes (500 mm dia.) of the primary circuit and the connected pipes of the low pressure emergency core cooling system (250 mm dia.) for the Dukovany Nuclear Power Plant. The results of the analysis have shown that the pipes of the emergency core cooling system do not meet the specified level of resistance to the effects of a safe shutdown earthquake (degree 5 on the MSK scale) in four elbows. As for the primary circuit pipes, permissible stress is only exceeded in the elbow before the mouth of the cold leg into the reactor. Seismic control measures have to be implemented to achieve the required earthquake resistance level. (Z.M.).

16054 (INIS-mf—10555, pp 136-143) **Protection of WWER type primary loops against extreme effects.** Podrouzek, J.; Rejent, B. (Skoda, Plzen, Czechoslovakia. Zavod Vystavba Jadernych Elektraren; Sigma, Prague, Czechoslovakia. Vyzkumny Ustav Cerpacich Zarizeni, Potrubi a Armatur). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

Dynamic analyses of the WWER-440 primary loops for the Mochovce nuclear power plant showed that the unprotected primary loop is very soft with a first eigenfrequency of 0.38 Hz. Protection with amortisseurs and viscous shock absorbers was compared and the viscous shock absorber in all cases proved to be more suitable. GERB viscous absorbers will be installed at the Mochovce nuclear power plant. First calculations of the dynamic resistance of the WWER-1000 primary loops for the Temelin nuclear power plant to extreme events were also made. It was shown that the unprotected primary loop is rather soft with a first eigenfrequency of 0.9 Hz, or 0.6 Hz at the pressurizer branch. It will therefore be necessary to protect the primary loops with viscous shock absorbers. (Z.M.).

16055 (INIS-mf—10555, pp 144-151) **Control calculations of seismic effects on pipes using integrated program package.** Roucka, M. (Kralovopolska Strojirna, Brno, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

The program for seismic analysis of the piping of a nuclear power plant is based on the finite element method. The calculation takes place in two stages. First the undamped eigenfrequencies and eigenvectors are calculated. The method of spectral response is then used for determining maximum response during individual eigenoscillations. The incorporation is being prepared of seismic analysis into the complex program package for the calculation of piping. Seismic stress will be incorporated into the calculation of fatigue strength. (Z.M.).

16056 (INIS-mf—10555, pp 167-172) **Dynamic measurement on main generating unit of Dukovany Nuclear Power Plant.** Holub, V. (Energoprojekt, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A11/MF A01. File Number DE87700736. (CONF-8410462—).

From 4. seminar on safety and operating reliability of the WWER reactor; Zelezna Ruda, Czechoslovakia (17 Oct 1984).

A number of computer programs exists for verifying the effects of extreme load on the main buildings of a Nuclear Power Plant, such as have the character of dynamic effect. In view of the many simplifications which are necessary for these complex calculations the validity of calculated values will have to be verified by experiment. Experimental measurements on the building of the main generating unit were made at the Dukovany nuclear power plant. Three mobile Vibroseis seismic vibrators were used for dynamic excitation providing a total excitation force of 450 kN within the frequency range of 10 to 35 Hz. The measured eigenfrequencies of the vibration of reinforced concrete monolithic structures are in good agreement with calculated values. (Z.M.).

16057 **(INIS-XN—44) Nuclear Liability Act as amended (No. 484/72).** (International Atomic Energy Agency, Vienna (Austria)). 8 Jun 1972. 32p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701306.

This Act which entered into force on 16th June 1972 adopted the essential principles laid down in the Paris Convention. These include in particular absolute liability of the operator, its limitation in amount and in time. (NEA).

16058 (INIS-XN—45) Decree bringing into force the Nuclear Liability Act (No. 486/72). (International Atomic Energy Agency, Vienna (Austria)). 16 Jun 1972. 1p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701307.

This decree brings into force the Nuclear Liability Act of 1972 as of 16th June 1972 except for the provisions of Sections 30 to 32 which deal with compensation in the framework of the Brussels Supplementary Convention. (NEA).

16059 (INIS-XN—50) Limiting the liability of the nuclear operator. (International Atomic Energy Agency, Vienna (Austria)). Spr 1986. 8p. (In English and French). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701312.

This is a reprint of an article from NEA Newsletter Volume 4, No. 1, OECD-NEA, Paris.

This article discusses the questioning of a fundamental principle of the special nuclear third party liability regime by certain NEA countries: the limitation of the nuclear operator's liability. This regime, set up since the late fifties at European then at worldwide level, had until now been widely adopted in the national legislation of most of the countries with a nuclear power programme. The author analyses the different arguments in favour of restoring unlimited liability for the nuclear operator and attempts to define its implications for the future of the nuclear third party liability regime in NEA countries. (NEA).

16060 (NUREG—1137-Suppl.5) Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425). (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Jan 1987. 119p. NTIS, PC A06/MF A01 - GPO. File Number TI87900484.

In June 1985, the staff of the Nuclear Regulatory Commission issued its Safety Evaluation Report (NUREG-1137) regarding the application of Georgia Power Company, Municipal Electric Authority of Georgia, Oglethorpe Power Corporation, and the City of Dalton, Georgia, for licenses to operate the Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425). Supplement 1 to NUREG-1137 was issued by the staff in October 1985, Supplement 2 was issued in May 1986, Supplement 3 was issued in August 1986, and Supplement 4 was issued in December 1986. The facility is located in Burke County, Georgia, approximately 26 miles south-southeast of Augusta, Georgia, and on the Savannah River. This fifth supplement to NUREG-1137 provides recent information regarding resolution of some of the open and confirmatory items that remained unresolved at the time the Safety Evaluation Report was issued.

16061 (NUREG/CR—4320) The relationships and influences of fuel and coolant system processes during LWR severe accidents. Rivard, J.B. (Sandia National Labs., Albuquerque, NM (USA); Nuclear Regulatory Commission, Washington, DC (USA). Div. of Accident Evaluation). Dec 1986. Contract AC04-76DP00789. 57p. (SAND—85-1449). NTIS, PC A04/MF A01 - GPO. File Number TI87005236.

This report places the processes of fuel and core damage, reactor coolant system (RCS) flow and heat transfer, and pressure vessel breach - and their respective fission product considerations - in the context of typical risk-dominant accident sequences. Thus the enhanced perception of the relationship (and thus importance) of these processes to the potential consequences of a severe-accident is provided. This is accomplished using both generic and plant-specific relational methods. It is found that the vessel and RCS processes pervasively influence consequences. The experiment programs designed to provide the in-vessel and RCS fuel damage data base are examined in light of this conclusion, and some suggestions are offered.

16062 (SAND—86-2909C) An experimental study of isothermal and boiling liquid jets. Marshall, B.W. Jr.; Berman, M. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 25p. (CONF-8610135—53). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005066.

From 14. water reactor safety information meeting; Gaithersburg, MD, USA (27 Oct 1986).

Recent observations inside the Three Mile Island-Unit 2 reactor core have shown that about 20 tons of core material melted and poured into the lower plenum. The core material is believed to have poured through and around the holes in the structural plates, creating jets of molten corium falling through water. The experimental work described in this paper illustrates the coarse-mixing behavior of molten jets of iron/alumina falling through water. Significant fragmentation of the jet occurs for pour diameters of 4 to 16 cm. The breakup of a boiling-jet appears to depend on the generation of steam and is significantly different from liquid-gas or isothermal liquid-liquid systems.

16063 (TPR-NS—28-No.1) Nuclear Safety: Technical progress review, January-March 1987. Silver, E.G. (ed.). (Oak Ridge National Lab., TN (USA)). Jan 1987. 159p. GPO. File Number TI87000271.

For the Western nuclear community the Chernobyl tragedy is indeed a special issue which presents a whole series of somewhat contradictory aspects, many of them distressing but some of them offering opportunities and new departures. The fact that Chernobyl happened in the USSR lessens its direct impact on our nuclear programs because the reactor design, safety philosophy, and operating practices are so divergent from ours, but this fact broadens immensely the range of reactor parameters and types about which we now have severe accident information. There appears to be very positive international political effects involving greater openness and willingness to share information by the Soviet Union and new international safety initiatives by the International Atomic Energy Agency (IAEA). The adverse health and economic impacts will affect the Russian population for a long time, but the opportunities for studies on effects of low-level radiation are also tremendous.

16064 Effect of pressurizer sizing on the turbine trip transient. Brownson, D.A.; Baratta, A.J.; Robinson, G.E. (Pennsylvania State Univ., Dept. of Nuclear Engineering, Univ. Park, PA 16802). *Nuclear Technology;* **75**: No. 1, 7-14(Oct 1986).

Following the Three Mile Island accident, a number of suggestions were offered for improving the safety of nuclear power plants. Many of these approaches involve increased dependence on complex and sophisticated safety systems and control technologies. An alternative approach to increased safety is explored; this approach involves the maximization of inherent safety features and minimization of safety and control system action. Specifically, the effects of changing pressurizer size and surge line configuration are examined to determine if the operation of the power-operated relief valve (PORV) could be eliminated during a turbine trip transient in a pressurized water reactor. The study is accomplished using the RETRAN-02 thermal-hydraulic analysis code. The results show that the opening of the PORV could be eliminated if the pressurizer size was doubled and the PORV setpoint increased slightly.

16065 Utility perspectives on decommissioning - the accounting involvement. Kovach, W.D. (Houston Lighting and Power Co., TX). *Transactions of the American Nuclear Society;* **53**: 74(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this paper is to discuss the approach taken by Houston Lighting & Power Company in determining a decommissioning plan and its continuing efforts toward funding of this plan for the South Texas Project. This approach is broadened to an overall utility viewpoint.

16066 Northrop Triga facility decommissioning plan versus actual results. Gardner, F.W. (Chem-Nuclear Systems, Inc.). *Transactions of the American Nuclear Society;* **53**: 129(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper compares the Triga facility decontamination and decommissioning plan to the actual results and discusses key areas where operational activities were impacted upon by the final US Nuclear Regulatory Commission (NRC)-approved decontamination

and decommissioning plan. Total exposures for fuel transfer were a factor of 4 less than planned. The design of the Triga reactor components allowed the majority of the components to be unconditionally released.

16067 **Research reactor and fuel development/production facility decommissioning technology and experience.** Hoovler, G.S.; Myers, P.M.; Caldwell, C.S. (Babcock & Wilcox). *Transactions of the American Nuclear Society;* 53: 129-130(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper discusses the technology and experience gained in a series of reactor and fuels development facility decommissioning programs carried out by Babcock & Wilcox (B & W) at its US Nuclear Regulatory Commission (NRC)-licensed sites in Lynchburg, Virginia. Areas of generic application to future projects are particularly emphasized. The projects included one test and one research reactor, four low-power critical experiment facilities, and two buildings that housed plutonium/uranium fuels development laboratories. These projects were comprehensive; they included developing the decommissioning and quality assurance plans, interfacing with the NRC, performing the actual decontamination/dismantling work, performing predecontamination and final radiological surveys, and volume reducing, packaging, certifying, classifying and shipping the radioactive waste for disposal.

16068 **Benchmark of systematic human action reliability procedure.** Spurgin, A.J.; Hannaman, G.W.; Moieni, P. *Transactions of the American Nuclear Society;* 53: 139(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Probabilistic risk assessment (PRA) methodology has emerged as one of the most promising tools for assessing the impact of human interactions on plant safety and understanding the importance of the man/machine interface. Human interactions were considered to be one of the key elements in the quantification of accident sequences in a PRA. The approach to quantification of human interactions in past PRAs has not been very systematic. The Electric Power Research Institute sponsored the development of SHARP to aid analysts in developing a systematic approach for the evaluation and quantification of human interactions in a PRA. The SHARP process has been extensively peer reviewed and has been adopted by the Institute of Electrical and Electronics Engineers as the basis of a draft guide for the industry. By carrying out a benchmark process, in which SHARP is an essential ingredient, however, it appears possible to assess the strengths and weaknesses of SHARP to aid human reliability analysts in carrying out human reliability analysis as part of a PRA.

16069 **Human approach to process control and the provision of predictive information.** Bernard, J.A. (Massachusetts Institute of Technology, Cambridge). *Transactions of the American Nuclear Society;* 53: 139-140(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This summary presents the results of a study on the human approach to reactor control. It was determined that the essential aspect of the human control process is the creation and maintenance of mental models for use in predicting plant response. Accordingly, the suggestion is made that faster-than-real-time analytical models be developed to assist operators in the verification of their control decisions. The Massachusetts Institute of Technology (MIT) and the Charles Stark Draper Laboratory (CSDL) are engaged in a joint program to develop advanced instrumentation and control systems for both commercial power and spacecraft reactors. As part of this effort, various digital technologies have been demonstrated on the 5-MW(th) MIT research reactor. These include signal validation and instrument fault detection, equipment status verification, closed-loop control using both analytical and rule-based approaches, control law reconfiguration, and paged computer displays. The success of the MIT-CSDL program has shown that these techniques can be used safely in the actual operation of a nuclear reactor.

16070 **Human factors in risk assessments of nuclear power plants.** Ryan, T.G. (Nuclear Regulatory Commission, Washington, DC). *Transactions of the American Nuclear Society;* 53: 143-144(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper discusses the current state of the human factor in assessments of risk at commercial nuclear power plants (NPPs) vis-a-vis the safety goals of the US Nuclear Regulatory Commission (NRC) and introduces an approach for enhancing the risk assessment process to more fully support those safety goals. It is suggested that risk assessments of NPPs, to date, generally have treated human performance in a peripheral manner. This lack of attention to and integration of the human factor may be attributed to an absence of a systems approach, among other things, excluding qualified human factors/human reliability specialists as full participants. The NRC, as part of its efforts to systematize PRA methodology, form both risk assessment and regulatory decision-making perspectives, is seeking enhanced procedures for integrating the human factor more fully into the PRA process. This involves specification of (a) behavioral science expertise required at each step in the process, (b) tasks to be performed by the behavioral scientist(s) to acquire necessary probabilistic and nonprobabilistic information and data on human performance within the context of the larger systems analysis, (c) interfaces between behavioral scientist(s) and other members of the analysis team (e.g., systems and analyst and PRA specialist), and (d) format and content of technical documentation to support both risk assessment and regulatory decision making.

16071 **Application of embedded training in nuclear power plant control rooms.** Ehrhardt, F.J.; Hopkins, C.O.; Jones, B.G. (Univ. of Illinois, Urbana). *Transactions of the American Nuclear Society;* 53: 144(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The objective of this research is to investigate the feasibility of including embedded training in the control rooms of future generation nuclear power plants. In this context, embedded training refers to the inclusion of operation instruction as an integral part of the system control room, in which operation and training occur simultaneously.

16072 **1986 viewpoint of emergency preparedness in the upper midwest.** Parkyn, J.D. (Dairyland Power Cooperative, La Crosse, WI). *Transactions of the American Nuclear Society;* 53: 69(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The recent Soviet emergency preparedness disaster has started a new round of interactions between utilities and civil governments regarding the adequacy of emergency preparedness around nuclear plants. The 1986 annual meeting of the cooperative produced several questions regarding the potentials of the plant and its impact on the public and the cooperative in the event of an off-normal situation. Emergency preparedness requires a real partnership between local civil authorities and the utility in a close spirit of cooperation with local law enforcement, which is frequently charged with the strongest burdens of emergency planning. It is more evident that the virtual veto power of local branches of government over emergency preparedness needs to be more fully recognized by utilities. Early notification and warning systems are coming under a tighter scrutiny as public perception of their fallibility increases. Another continuing problem with emergency preparedness has been the recognition that guarantees of reaching every individual, particularly in more hostile environments, can not be easily made. The lessons learned in nuclear planning indicate that this is an area too often not given a high enough threshold in the total spectrum of nuclear safety and which, from the utility standpoint, needs to be elevated to a higher threshold of importance.

16073 Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario. Meieran, H.B. *Transactions of the American Nuclear Society;* 53: 69-70(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The consequences of radiological emergencies associated with recent accidents at nuclear power plants have been well publicized - 7 yr ago on March 28, 1979, at Three Mile Island unit No. 2 (TMI-2) in Middletown, Pennsylvania, and more recently on April 26, 1986, at the Chernobyl nuclear power station unit No. 4 in the Ukraine, USSR. Estimates of released radiation from both of these plants ranged from <20,000 Ci at TMI-2 to 100,000,000 Ci at Chernobyl. Unfortunately, there were few, if any, facilities, infrastructures, and specialized equipment located near the accidents that could assist in remotely mitigating the consequences associated with the accidents. The remote assistance that could have been offered by robotic and teleoperator-controlled mobile vehicles would have minimized the radiation exposures to personnel who would be assisting in restoring the damaged facilities, evacuating the affected personnel, and removing the contaminated material and equipment. There are, however, considerable numbers of existing equipment and off-the-shelf technologies that could be mobilized and employed immediately within days after a Chernobyl-type accident. Examples of missions and tasks that these mobilized remotely controlled mobile vehicles could be assigned to are listed.

16074 Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment. Heck, W. (GPU Nuclear, Parsippany, NY). *Transactions of the American Nuclear Society;* 53: 72(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Oyster Creek Nuclear Generating Station (OCNGS) is located 6 mi west of the Atlantic Ocean. From spring through late summer, atmospheric transport in the vicinity of OCNGS is periodically affected by the ocean breeze. The ocean breeze produces large differences in wind direction within the OCNGS emergency planning zone during the morning to evening hours. In addition, trajectory reversals can occur near the ocean breeze front. These two characteristics of the ocean breeze must be taken into account when interpreting results from conventional atmospheric dispersion models. The purpose of the study was to determine the flow characteristics of the ocean breeze and to apply these characteristics to an emergency preparedness implementing procedure (EPIP). The EPIP would be used to determine the radiological plume impact region if an accidental release occurred during an ocean breeze.

16075 Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A. Wigeland, R.A. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* 53: 303-304(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The present emphasis on inherent safety and inherently safe designs for liquid-metal reactors has resulted in a need to represent the various reactivity feedback mechanisms as accurately as possible. In particular, the reactivity feedback from radial core expansion has been found to provide the dominant negative feedback contribution in postulated anticipated transient without scram (ATWS) events. Review of the existing modeling in the SASSYS/SAS4A computer code system revealed that while the modeling may be adequate for the early phases of various unprotected transients, the accuracy would be less than desirable for the extended transients which typically occur for inherently safe designs. The existing model for calculating the reactivity feedback from radial core expansion uses a feedback from radial core expansion uses a feedback coefficient in conjunction with changes in the temperatures of the grid support plate and the above-core load pad. The accuracy of this approach is determined partly by the conditions used in deriving the feedback coefficient, and their relevance to the transient being investigated. Accuracy is also affected by the need to include effects other than those that could be directly related to changes in the grid plate and above-core load pad temperatures, such as subassembly bowing and the potential for clearances to occur between subassemblies in the above-core load pad region. As a result, a detailed model was developed in an attempt to account for these and other effects in a more mechanistic form.

16076 Impacts of reactivity feedback uncertainties on inherent shutdown in innovative designs. Mueller, C.J. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* 53: 305-306(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The concept of inherent shutdown is emphasized in the approach to the design of innovative, small pool-type liquid-metal reactors (LMRs). This paper reports an evaluation of reactivity feedback uncertainties used in the analyses of anticipated transients without scram for innovative LMRs, and the associated impacts on safety margins and inherent shutdown success probabilities on unprotected loss-of-flow (LOF) events. It then assesses the ultimate importance of these uncertainties on LOF and transient overpower events in evolving metal and oxide innovative designs.

16077 Gravity-driven core cooling system for a BWR. Huang, R.L.; Paradiso, F.M.; Sawyer, C.D.; Choe, H. (General Electric, San Jose). *Transactions of the American Nuclear Society;* 53: 308-309(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An innovative, mid-sized [300- to 600-MW(e)] boiling water reactor (BWR) concept possessing a high degree of inherent safety has been designed by the General Electric Company. Many of the most recent concepts were developed under the sponsorship of the Electric Power Research Institute's Advanced Light Water Reactor program. The design maximizes the use of BWR technology and operating experience. Modest innovations are included to simplify the performance of safety functions using primarily passive systems. These, as well as other system and structural simplifications, together with a reduced power rating, have the potential to reduce total costs and significantly speed construction.

16078 Passive steam-driven injector as ECCS for an inherently safe BWR. Jayanti, S.; Christensen, R.N. (Ohio State Univ., Columbus). *Transactions of the American Nuclear Society;* 53: 310-312(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Nuclear reactor safety is a major public issue which threatens the future of the nuclear energy option in the US and many other foreign countries. Much discussion has occurred recently concerning systems that incorporate more inherent safety and eliminate some of the complex safety systems without having to incur a significant economic penalty. Participating in the debate, the faculty and the students in the Nuclear Engineering Program at the Ohio State University (OSU) have conceptually developed a 340-MW(e) inherently safe reactor (ISR). The design makes extensive use of conventional light water technology, but it also incorporates several innovative inherent safety features. This paper describes the preliminary analysis of the proposed concept and discusses the safety benefits derived from it.

16079 Application of the GEM shutdown device to the FFTF reactor. Waldo, J.B.; Padilla, A. Jr.; Nguyen, D.H.; Claybrook, S.W. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* 53: 312-313(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A novel device called the gas expansion model (GEM) is being developed at the Hanford Engineering Development Laboratory for testing in the 400-MW(th) fast flux test facility (FFTF) reactor. Incorporation of the GEM into liquid-metal reactor designs is intended to measurably contribute to the achievement of inherent safety, by allowing the reactor to passively shut down even in the extremely remote (hypothetical) event of an unprotected (no scram) loss-of-flow accident. The purpose of this paper is to describe the GEM and present predictive analyses of the effectiveness of the device during unprotected loss-of-flow experiments in the FFTF.

16080 **Smart approach to level-1 probabilistic risk assessment.** Harper, F.T.; Camp, A.L. (Sandia National Labs., Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 315-316(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US Nuclear Regulatory Commission (NRC) is preparing NUREG-1150 to examine the current perception of risk from a selected group of nuclear power plants. NUREG-1150 will provide the base for comparison of NRC research to industry results, and resolution of numerous severe accident issues. In support of NUREG-1150, Sandia National Laboratories (SNL) has directed the production of Level 1 Probabilistic Risk Assessment (PRAs) for the Surry, Sequoyah, Peach Bottom, and Grand Gulf nuclear power plants. Due to severe time and resource constraints, it was necessary to produce an efficient to smart approach to carry out these analyses. The purpose of this paper is to describe and evaluate the methodology selected. The results produced for NUREG-1150 are described in other papers.

16081 **Summary of core damage frequency from internal initiators: Surry.** Bertucio, R.; Quilici, M.; Young, J. *Transactions of the American Nuclear Society;* **53**: 316-318(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents the results of the recent Level 1 Probabilistic Risk Assessment (PRA) performed on the Surry Nuclear Power Station Unit 1. The PRA provided information about light-water reactor risk to the US Nuclear Regulatory Commission (NRC) Office of Research, in support of NUREG-1150, which will examine the NRC's current perception of reactor risk. The Surry Nuclear Power Station has two units of 788-MW(e) capacity and is located near Surry, Virginia. The reactors are Westinghouse three-loop pressurized water reactors with large, dry, subatmospheric containments. The Surry plant was previously analyzed by the Reactor Safety Study. The study was performed in accordance with the methodology described in an accompanying paper in this session.

16082 **Summary of core damage frequency from internal initiators: Peach Bottom.** Kolaczkowski, A.M.; Lambright, J.A.; Cathey, N. (SAIC, Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 318-320(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Probabilistic risk assessments (PRAs) based on internal initiators are being conducted on a number of reference plants to provide the US Nuclear Regulatory Commission (NRC) with updated information about light-water reactor risk. The results of these analyses will be used by the NRC to prepare NUREG-1150 which will examine the NRC's current perception of risk. Peach Bottom has been chosen as one of the reference plants. The Peach Bottom Atomic Power Station has two boiling water reactor (BWR) units, each with a capacity of 1150 MW(e). The reactors are each housed in a Mark I containment. Peach Bottom Unit 2 analyzed here, was studied before as part of WASH-1400. A number of plant features tend to be important in determining the nature and frequency of the core melt scenarios for Peach Bottom. These features include the recent above-average diesel generator performance history, the single emergency service water system for both units, the numerous emergency core cooling systems, recent procedure modifications and the low volume containment.

16083 **Summary of core damage frequency from internal initiators: Sequoyah.** Bertucio, R.; Leahy, T.; Held, J. *Transactions of the American Nuclear Society;* **53**: 320-322(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents the results of the recent Level 1 Probabilistic Risk Assessment (PRA) performed on the Sequoyah Nuclear Power Station Unit 1. The PRA provided information about light water reactor risk to the US Nuclear Regulatory Commission (NRC) Office of Research, in support of NUREG-1150, which will examine the NRC's current perception of reactor risk. The Sequoyah Nuclear Station has two units of 1128 MW(e) capacity and is located near Chattanooga, Tennessee. The reactors are Westinghouse four-loop pressurized water reactors (PWRs) with ice-condenser containments. The Sequoyah plant was previously analyzed by the Reactor Safety Study Methodology Application Program (RSSMAP). The study was performed in accordance with the methodology described in an accompanying paper in this session. The list of initiators which were explicitly quantified included three loss-of-coolant accident (LOCA) sizes, interfacing LOCAs, loss of offsite power, turbine trip with and without main feedwater, loss of a direct current (dc) bus, and loss of the component cooling water system.

16084 **Summary of core damage frequency from internal initiators: Grand Gulf.** Drouin, M.T.; LaChance, J.L.; Shapiro, B.J.; Wheeler, T.A. (SAIC, Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 322-323(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Probabilistic risk assessment (PRAs) based on internal initiators are being conducted on a number of reference plants to provide the US Nuclear Regulatory Commission (NRC) with updated information about light-water reactor risk. The results of these analyses will be used by the NRC to prepare NUREG-1150 which will examine the NRC's current perception of risk. Grand Gulf has been chosen as one of the reference plants. The Grand Gulf Nuclear Plant has two boiling water reactor (BWR) units, each with a capacity of 1250 MW(e). Unit 1 has been in commercial operation since July 1985, Unit 2 is still under construction. The reactors are each housed in a Mark III containment. Grand Gulf Unit 1 analyzed here was studied before as part of RSSMAP. A number of plant features tend to be important in determining the nature and frequency of the core melt scenarios for Grand Gulf. These features include the numerous emergency core cooling systems, systems that are designed to pump saturated water, excellent test and maintenance procedures, the effect of containment failure on injection lines, the isolation of critical components by structural barriers (e.g., enclosed rooms, solid floors/ceilings), and the poor station blackout procedures.

16085 **Evolution of PRA methodology and insights since WASH-1400.** Harper, F.T.; Camp, A.L. (Sandia National Labs., Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 324-325(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The US Nuclear Regulatory Commission (NRC) is preparing NUREG-1150 to examine the current perception of risk from a selected group of nuclear power plants. In support of NUREG-1150, Sandia National Laboratories (SNL) has directed the production of Level 1 Probabilistic Risk Assessments (PRAs) for the Surry, Sequoyah, Peach Bottom, and Grand Gulf nuclear power plants; additional studies are planned. The first four plants have been studied previously in either WASH-1400 or RSSMAP. The more recent studies suggest significant changes in perception of dominant accident sequences. In this paper the authors examine the changes in their perception of the likelihood of severe core damage accidents, in terms of both changes in PRA methodology and changes to the plants as a result of evolving regulations.

16086 **Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident.** Hassan, Y.A. (Texas A & M, College Station). *Transactions of the American Nuclear Society;* **53**: 326-328(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The postulated loss-of-coolant accident (LOCA) of a pressurized water reactor has been the subject of intensive experimental and analytical studies in light water reactor safety analysis. Many efforts are devoted to the investigation of the thermodynamic behavior of the reactor core and the effectiveness of the emergency-core-cooling system during reflood phase of a LOCA. In the initial period of reflood phase, the flow patterns at the core higher elevation are considered as the dispersed flow regime. The effect of

liquid phase on the heat transfer cannot be neglected in this dispersed flow regime. It has been found experimentally that a steam-water-droplet flow is ultimately responsible for terminating the cladding temperature excursions in a LOCA. Recently, a study of reflood test predictions with RELAP5/MOD2 showed a tendency to predict lower cladding temperatures during the dispersed flow regime. The purpose of this study is to present a new dispersed flow film boiling, implemented in RELAP5/MOD2. In addition, the RELAP underestimated the vapor temperature. Therefore, a revised interfacial heat transfer coefficient between the droplets and steam was incorporated in the code. Comparison of the current predicted cladding/fuel temperature histories with the reflood data showed a fair agreement.

16087 **Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2.** Hassan, Y.A.; Morgan, C.D. (Texas A & M, College Station). *Transactions of the American Nuclear Society;* **53**: 328-330(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

To date, there are only very limited data for nonequilibrium convective film boiling in rod bundle geometries. A recent nine (3 x 3)-rod bundle post-critical heat flux (CHF) from the Lehigh University test facility was simulated using RELAP5/MOD2 cycle 36.02, to assess its capabilities in predicting the overall convective mechanisms in post-CHF heat transfer in rod bundle geometries. The code calculations were compared with the experimental data. With the exception of a premature quench, the cladding temperatures were in a reasonable agreement with the data. However, the code predicted low vapor superheats and void fraction oscillations.

16088 **TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility.** Shire, P.; Boyack, B. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 331-332(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Transient Reactor Analysis Code, TRAC-PF1/MOD1, was used to analyze an upper-plenum model of the Slab Core Test Facility (SCTF). The SCTF is a two-dimensional thermal-hydraulic model of a pressurized water reactor used for core-reflood simulations by the Japan Atomic Energy Research Institute. The purpose of this study was to evaluate the effects of code input-model refinements on the comparison between TRAC calculations and test data. Of particular interest were the comparisons of upper-plenum liquid levels and of the distributions of liquid radially across the upper-plenum. The upper-plenum region was selected for study. The test data indicated that the liquid level responded to the onset of emergency core cooling (ECC) by rising in the upper-plenum immediately when injection occurred. However, the early TRAC results indicated no significant liquid level increase until ~300 s after the injection. Test data also indicated a liquid gradient rising toward the hot-leg entrance, but none was observed with TRAC.

16089 **Use of the Chen boiling heat transfer correlation in once-through steam generator analysis.** Morgan, C.D.; Hassan, Y.A. (VMI Research Labs., Lexington, KY). *Transactions of the American Nuclear Society;* **53**: 332-334(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A method of modifying the Chen boiling correlation for applications where the flow is parallel to rod bundles has been presented which is based on analogous improvements in heat transfer to water during nonboiling flow parallel to rod bundles. This technique gives good results for applications to the B & W OTSG and should be more reliable when extrapolating to other geometries than the previous technique of using P-D for the equivalent diameter.

16090 **BWR/6 DBA analysis with limited ECC.** Aksan, S.N.; Analytis, G.T. (Eidgenoessisches Institut fuer Reaktorforshung, Wuerenlingen, Switzerland). *Transactions of the American Nuclear Society;* **53**: 334-335(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An important problem in the analysis of loss-of-coolant accident (LOCA) is related to the efficiency of the emergency core cooling systems (ECCSs). Evaluation of core coolability becomes particularly important in the case of delayed action of the aforementioned systems and/or if the water injection rate they provide is limited to a fraction of the design capacity. The transient reactor analysis code TRAC-BD1 version 12 was employed to analyze a boiling water reactor/6 (BWR/6) core behavior under LOCA with limited ECCS. The authors shall be presenting the results of a generic BWR/6 recirculation line break for the case that only one low-pressure coolant injection (LPCI) is operational (limited ECCS case), and the authors compare them to the case that all ECCSs are normally operating (base case).

16091 **Analysis of MSIV-ATWS events with the BNL plant analyzer.** Diamond, D.J. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 335-336(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In a boiling water reactor (MWR) when there is closure of the main steam isolation valves (MSIVs) the energy generated in the core will be transferred to the pressure suppression pool (PSP) via steam that flows out the relief valves. The pool has limited heat capacity as a heat sink and, hence, if there is no reactor trip, there is the possibility that the pool temperature may rise beyond acceptable limits. In the past few years there have been several studies of this problem with emphasis on calculating the power level in the core. In the present study the authors consider the power level as well as the resulting PSP temperature and take into account different assumptions regarding plant parameters and operator actions. The Brookhaven National Laboratory (BNL) Plant Analyzer (BPA) with a BWR/4 plant model was used to do the calculations. The BPA is a special-purpose minicomputer in combination with state-of-the-art thermal-hydraulic modeling that can calculate the behavior of a BWR plant at faster-than-real-time speeds.

16092 **TRACB04 study on suppression pool swelling during containment venting.** Cheung, Y.K.; Chu, K.H.; Teng, J.T. (General Electric Co., San Jose, CA). *Transactions of the American Nuclear Society;* **53**: 337-338(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Following postulated loss-of-decay-heat removal accidents in a boiling water reactor (BWR), continued steam generation in the core could lead to containment overpressurization. The Emergency Procedure Guidelines (EPG), developed jointly by the BWR Owners Group and General Electric Company, recommend operator action to vent the primary containment, as the last resort, to avoid adverse consequence to the containment or potentially to the core. The EPGs provide recommendations to be used by individual utilities in development of their plant's unique emergency operating procedures (EOPs). In formulation of the EOPs for containment venting, a number of factors must be assessed to assure that the operator actions are taken at the proper time and that the minimum consequence of venting results. Among these factors, induced pool-swell loads on containment were postulated due to such events as downcomer clearing and bulk nucleation. This paper presents the results of a study, using computer code TRACB04 of pool swelling induced by venting the containment at high pressure. TRACB04, an enhanced version of TRAC, is a best-estimate computer code for the analysis of BWR transients.

16093 **Summary of PWR leak detection studies.** Cho, J.H.; Elia, F.A. Jr. (Stone & Webster Engineering Corp., Boston, MA). *Transactions of the American Nuclear Society;* **53**: 338-340(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Thermal-hydraulic analysis can be used to determine the location and magnitude of leaks inside and location of leaks outside a pressurized water reactor (PWR) containment as required by plant technical specifications. The major advantage of this detection

method is that it minimizes radiation exposure of maintenance personnel because most of the leak detection process is performed from the control room outside containment. Plant-specific analyses are utilized to predict change in parameters such as local dew point temperature, relative humidity, dry bulb temperature, and flow rate to sump for various leak rates and enthalpies. These parameter responses are then programmed into the plant computer and instrumentation is provided for area monitoring. The actual inputs are continuously monitored and compared to the predicted plant responses to identify the leak location and quantify the leak. This study concludes that a system that monitors dew point (or relative humidity) and dry bulb temperature changes together with the flow rate to the sump will provide the capability to both locate and quantify a leak inside a containment, while a system that monitors dew point temperature (or relative humidity) changes will provide the capability to locate a leak outside a containment.

16094 **Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy.** Takeuchi, K.; Young, M.Y. (Westinghouse Corp.). *Transactions of the American Nuclear Society;* **53**: 340-342(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Realistic calculations of the peak cladding temperature during a hypothetical loss-of-coolant accident (LOCA) have been found to produce temperatures much lower than the limit required by Appendix K and the value usually calculated with current licensing models. Recently, an assessment was made of COBRA/TRAC code, against several loss-of-fluid test (LOFT) experiments. This assessment indicated generally good agreement with a variety of thermal and hydraulic parameters. It was found that the fuel gas size, which determined the initial fuel stored energy, was an important parameter determining the peak cladding temperature. A sensitivity study was performed to assess the effect of variations in initial fuel temperature on calculated results. The computed peak cladding temperature was then compared with the test data of L2-3 and L2-5 tests.

16095 **Continuous Bayesian updating; Normal and two stage.** Berger, R.E. (Pacific Gas & Electric Co.). *Transactions of the American Nuclear Society;* **53**: 343-344(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Bayes Theorem is a mathematical relationship used frequently in probabilistic risk assessment. Its usual purpose is to update generic failure data with plant-specific data to produce a failure rate estimate which best expresses the authors state of knowledge. The theorem equation becomes very difficult to solve in practice, so a discrete approximation is used. However, this approximation itself becomes very complicated and time consuming to apply, especially when two-stage Bayesian analyses are performed. In fact, two-stage Bayesian analysis is commonly done with a mainframe computer code. This paper makes use of an important feature of Bayes Theorem to greatly simplify the solution process. The final result is a set of calculations which are simple enough to be done on a hand calculator or personal computer.

16096 **LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique.** Kim, T.W.; Lee, B.H.; Chang, S.H. *Transactions of the American Nuclear Society;* **53**: 344-346(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An uncertainty analysis method is proposed here, which uses Fourier Amplitude Sensitivity Test (FAST) and Stepwise Regression Technique (SRT). This method is a compromise between the approximation method [response surface method (RSM) or moments method] and Monte Carlo method (MCM). It is concluded that: 1. FAST gives the partial variance for each input parameter, which can be used as global sensitivity ranking between input parameters, with moderate sampling point compared to crude MCM. 2. SRT is a good tool to construct the later-used first- or second-order response surface model consisting of comparatively important parameters. 3. The combined uncertainty analysis method using FAST and SRT can be used for uncertainty/sensitivity analysis of the large computer codes with moderate cost and it will be a useful tool to analyze the feasibility of the newly developed, highly uncertain system models.

16097 **Four-train support always more reliable than a two-train support?.** Guey, C.N.; Arrieta, L.; Youngblood, R. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 347-348(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Once the gross features of a frontline fluid system have been defined, one must consider what support system configuration will provide the best overall system performance. This paper considers different direct-current (dc) bus configurations for a given emergency feedwater system (EFWS). Results indicate that a four-train support system (i.e., 4 dc buses) gives a lower system unavailability for transients, but a higher system unavailability for anticipated transients without scram (ATWSs), than a two-train support system (i.e., two dc buses). This serves to illustrate that more trains do not necessarily provide higher reliability, and that a configuration choice which is better for one emission success criterion may be worse for another. Because of the small characteristic unreliability of dc buses, the numerical comparisons made here are not dramatic, but the underlying topological point is nevertheless broadly applicable.

16098 **New scenario for intersystem LOCAs in BWRs.** Chu, T.L.; Stoyanov, S. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 348-349(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of the work is to analyze the scenario of intersystem loss-of-coolant accidents (LOCAs) in the feedwater lines of boiling water reactors (MBWRs), in light of the water hammer event at San Onofre, Unit 1. Such scenario has a potential for high frequency and high consequence. The frequency is potentially high because a similar event has occurred; the consequence is high because containment is bypassed. To summarize, the frequency of intersystem LOCA in the feedwater line of a BWR is estimated to be $\sim 10^{-3}$/yr. If all of the ECCS systems are disabled by environment caused by the blowdown, the frequency of core damage in such a LOCA will be as high as the frequency of the LOCA itself. Plant-specific analysis is needed to assess the effect of blowdown on ECCS.

16099 **Probabilistic analysis of allowed outage times relaxation at a PWR plant.** Cho, N.; Chu, T.; Xue, D.; Bozoki, G.; Youngblood, R. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 349-351(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Technical specifications (TS) in a nuclear power plant are specific requirements on its day-to-day operation, designed to protect public health and safety. Two primary aspects of the TS are (a) limiting conditions of operation with allowed outage times (AOTs) and (b) surveillance testing intervals. In recent years, there has been growing interest in the nuclear community in reexamining the TS. One of the reasons is that a significant portion of reactor downtime (plant unavailability) is attributable to the strict TS. Existing TS were derived from engineering judgment based on deterministic review; they were not directly risk-based, and their efficacy in enhancing public safety is difficult to establish. This paper presents a summary of a critical review of the Westinghouse report, which proposed that AOTs for a number of safety systems at the Byron Generating Station be increased from 3 to 7 days.

16100 **Analysis of reactor trips involving balance-of-plant failures.** Seth, S.; Skinner, L.; Ettlinger, L.; Lay, R. (Mitre Corp.). *Transactions of the American Nuclear Society;* **53**: 351-353(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The relatively high frequency of plant transients leading to reactor trips at nuclear power plants in the US is of economic and safety concern to the industry. A majority of such transients is due to failures in the balance-of-plant (BOP) systems. As a part of a study conducted for the US Nuclear Regulatory Commission, Mitre has carried out a further analysis of the BOP failures associated with reactor trips. The major objectives of the analysis were to examine plant-to-plant variations in BOP-related trips, to understand the causes of failures, and to determine the extent of any associated safety system challenges. The analysis was based on the Licensee Event Reports submitted on all commercial light water reactors during the 2-yr period, 1984-1985.

16101 **Stimulator-based model for estimating operator diagnosis failure probabilities.** Whitehead, D.W.; Weston, L.M.; Graves, N.L. (Sandia National Labs., Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 353(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents a new method for analyzing operators recovery actions following hypothesized accidents at a nuclear power plant. The actions analyzed were identified as part of the ongoing LaSalle Probabilistic Risk assessment, a part of the US Nuclear Regulatory Commission-sponsored Risk Methods Integration and Evaluation Program (RMIEP). In the authors model, the recovery actions have been broken down into two distinct phases: the diagnosis phase and the action phase. This paper pertains to the diagnosis phase and the analysis uses simulator data to estimate the probability of failure-to-diagnose as a function of time.

16102 **QUASAR: a methodology for quantification of uncertainties in severe-accident source terms.** Khatib-Rahbar, M.; Park, C.; Pratt, W.T.; Bari, R.A.; Ryder, C.; Marino, G. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 354-355(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The radiological consequences of severe nuclear reactor accidents are governed, in large part, by the magnitude and characteristics of the radioactivity release, or radiological source term, from the plant. Over the last decade, substantial development and progress have been made in the state of knowledge concerning the nature of severe accidents and associated fission product release and transport. As part of this continuing effort, the US Nuclear Regulatory Commission has sponsored the development of the source term code package (STCP), which models core degradation, fission product release from the damage fuel, and the subsequent migration of the fission products from the primary system to the containment and finally the environment. The purpose of the present paper is to describe a methodology that was developed as part of the Quantification and Uncertainty Analysis of Source Terms for Severe Accidents in Light Water Reactors (QUASAR) program at Brookhaven National Laboratory. QUASAR is a large program that will apply the methodology described in this paper to severe accident sequences in light water reactors using the STCP.

16103 **Effect of hygroscopicity on aerosol behavior.** Baron, J.; Drozd, A. (Stone & Webster Engineering Corp., Boston, MA). *Transactions of the American Nuclear Society;* **53**: 355-356(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This study examined the hygroscopic effect on aerosol behavior by modifying the condensation model employed in the NAUA-4 computer program to include the hygroscopic properties of CsOH. Correlations were developed for water vapor pressures over CsOH solutions, solution surface tension, and solution thermal conductivity in order to determine the condensation rate on particles. Expressions for the solution density and for the liquidus curve were also developed to calculate solution volume and to partition CsOH between dissolved and nondissolved states.

16104 **Experimental determination of the partition coefficient of HOI.** Harrell, J.R.; Lutz, J.B.; Kelly, J.L. (Univ. of Virginia, Charlottesville). *Transactions of the American Nuclear Society;* **53**: 356-357(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An understanding of iodine-water chemistry and the partitioning of iodine species between the liquid and vapor phases is necessary for the purpose of iodine source term evaluations. Hypoiodous acid (HOI) is a volatile iodine species formed by the hydrolysis of iodine. In a well-mixed system, equilibrium between the vapor and liquid phases is quickly attained and is quantified in terms of the partition coefficient (PC). At the ANS Topical Meeting on Fission Product Behavior and Source Term Research at Snowbird, Utah, other investigators reported values for the HOI PC in excess of 10^4. Work at the University of Virginia, however, indicates that a more realistic value is closer to 10^3. This paper summarizes that work.

16105 **Effects of organic impurities on the partitioning of iodine.** Lutz, J.B.; Kelly, J.L. (Univ. of Virginia, Charlottesville). *Transactions of the American Nuclear Society;* **53**: 357-358(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

For the purpose of iodine source term calculations, a knowledge of the time dependence of iodine partitioning and the composition of the volatile iodine species may be very important. This study demonstrates the disposition of iodine in a water-air system subjected to gamma radiation can be significantly affected by the presence of organics in the liquid and/or vapor phases. The presence of methanol in a gamma-irradiated water-air-iodine system tends to increase the total iodine partition coefficient over that which would be observed in the absence of methanol. In contrast to methanol, the presence of methane tends to lower the IPC of an irradiated water-air-iodine system, because gaseous molecular iodine (I_2)and methane react to form highly volatile organic iodides.

16106 **TREAT source-term experiment STEP-1 simulating a PWR LOCA.** Simms, R.; Baker, L. Jr.; Blomquist, C.A.; Ritzman, R.L. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 358-359(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In a hypothetical pressurized water reactor (PWR) large-break loss-of-coolant accident (LOCA) in which the emergency core cooling system fails, fission product decay heating causes water boil-off and reduced heat removal. Zircaloy cladding is oxidized by the steam. The noble gases and volatile fission products such as cesium and iodine that constitute a principal part of the source term will be released from the damaged fuel at or shortly after the time of cladding failure. TREAT test STEP-1 simulated the LOCA environment when the volatile fission products would be released using four fuel elements from the Belgonucleaire BR3 reactor. The principal objective was to collect a portion of the releases carried by the flow stream in a region as close as possible to the test zone. In this paper, the test is described and the results of an analysis of the thermal and steam/hydrogen environment are compared with the test measurements in order to provide a characterization for analysis of fission product releases and aerosol formation. The results of extensive sample examinations are reported separately.

16107 **Effects of water in film boiling over liquid-metal melts.** Greene, G.; Finfrock, C.; Burson, S.B. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 360-362(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Speculation concerning the effects of an overlying pool of boiling water on a molten LWR core/concrete interaction varying widely and range from no effect other than a source of steam to complete quenching of the debris. In the effort to quantify the effects, the experimental investigation to be described was initiated. Liquid-liquid boiling experiments have been performed with H_2O

and liquid-metal melts in the 100-series test matrix (runs 121, 126, 127) and the VE test matrix. Some of the pre-explosion unstable film boiling data as well as observations from the explosive series have been previously reported. It was observed that water boiling on liquid-metal melts was unstable with respect to disturbances, and that liquid-liquid contacts were occurring at the boiling interface well into the film boiling superheat regime. The presence of these liquid-liquid contacts in film boiling was substantiated by photographic observations in transparent test sections. Narrow liquid-metal jets were observed to spike upward into the boiling water pool above, smearing out the interface between the two fluids into a mixing zone of water and liquid metal. The thickness of this mixing zone appeared from visual observations to be in the range of 1 to 2 cm. It is not presently clear what physical phenomena were responsible for this behavior; however, liquid-solid contacts as well as liquid-liquid contacts in the film boiling regime will be investigated in a future test series.

16108 **MHTGR confinement radiation releases.** Maneke, J.L.; Lanning, D.D.; Lidsky, L.M.; Oddo, J.M.; Baron, J.S.; Drozd, A. (Massachusetts Institute of Technology, Cambridge). *Transactions of the American Nuclear Society;* **53**: 362-364(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Investigations of the chemical form and transport of two fission products released during selected modular high-temperature gas-cooled reactor (MHTGR) postulated accidents have resulted in the conclusion that estimated doses are reduced by as much as 30% when aerosol deposition and chemical species effects are included. Applying chemical equilibrium principles and collision theory, aerosol removal rates were calculated with MHTGR-NAUA, a modified version of the NAUA Mod-4 light water reactor aerosol analysis computer program. The effect of input assumptions on fission product release and off-site dose was then evaluated with the SCIMCA computer program. Preliminary estimates of radiation releases from an MHTGR during credible accidents are well below existing limits. These low estimated releases provide both a safety and an economic incentive for MHTGR development. For example, it is calculated that a non-pressure-retaining building, such as the confinement design shown could adequately protect the public from radiological releases.

16109 **Reinspection methods implemented for quality.** Christensen, J.D.; Heller, A.S. *Transactions of the American Nuclear Society;* **53**: 387-388(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The classification of important to safety has been in the forefront of nuclear power plant operations in recent years. While management does faithfully adhere to the quality assurance program requirements of 10CFR50, Appendix B, the scope of program applicability often does not cover all aspects of operations that indirectly affect safety. A key factor that is considered important to safety, yet has few regulations guiding it, is the quality of performance. The degree of quality to which a person performs a task is subjective in nature. When compared to another person's performance, a measure of quantification is introduced, yet this comparison is a function of many factors, not the least of which is the objectivity of the person who judges or makes the comparisons between the performers. In this paper a program has been described that places the evaluation of job performance on a more quantitative basis. Similar programs have been implemented with success.

16110 **Method to integrate PRA results with plant upgrades.** Weaver, W.W. *Transactions of the American Nuclear Society;* **53**: 390-391(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A question frequently posed by plant personnel is how to make the best use of a completed probabilistic risk assessment (PRA). A proposed methodology is presented here. Its utility is illustrated by performing an analysis with the preliminary results of the TMI-1 PRA. An initial step in formulating a theoretic decision is determination of the appropriate criteria upon which the decision is to be based. A straightforward approach makes use of two basic criteria: risk reduction in terms of core melt frequency (i.e., the US Nuclear Regulatory Commission has expressed a value of 1×10^{-4}/reactor-yr as the goal) and present value (PV) dollars. The methodology presented is similar to a quantified cost/benefit study. It can be used in conjunction with results from any completed PRA or system reliability analyses.

16111 **Quantile arithmetic methodology for uncertainty propagation in fault trees.** Abdelhai, M.; Ragheb, M. (Univ. of Illinois, Urbana). *Transactions of the American Nuclear Society;* **53**: 391-393(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A methodology based on quantile arithmetic, the probabilistic analog to interval analysis, is proposed for the computation of uncertainties propagation in fault tree analysis. The basic events' continuous probability density functions (pdf's) are represented by equivalent discrete distributions by dividing them into a number of quantiles N. Quantile arithmetic is then used to performthe binary arithmetical operations corresponding to the logical gates in the Boolean expression of the top event expression of a given fault tree. The computational advantage of the present methodology as compared with the widely used Monte Carlo method was demonstrated for the cases of summation of M normal variables through the efficiency ratio defined as the product of the labor and error ratios. The efficiency ratio values obtained by the suggested methodology for $M = 2$ were 2279 for $N = 5$, 445 for $N = 25$, and 66 for $N = 45$ when compared with the results for 19,200 Monte Carlo samples at the 40th percentile point. Another advantage of the approach is that the exact analytical value of the median is always obtained for the top event.

16112 **Evaluating the safety of nuclear plant changes.** Bonaca, M.V.; Kai, M. (NUS Corp., Rockville, MD). *Transactions of the American Nuclear Society;* **53**: 402-403(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Once a reactor design has been shown to provide an acceptable level of public risk and the license is issued, it is the responsibility of the utility to maintain the design basis of the plant. This is a difficult job because of the many system modifications that take place and the determinations that must be made as to whether a modification constitutes a change in the design basis and requires a review by the NRC. The criteria for this determination are specified in the Code of Federal Regulations in section 10CFR50.59. The importance of understanding the relationship of this law to public safety is discussed in the paper. At Northeast Utilities, unilateral steps have been taken in clearly specifying definitions and quantifying limits for increase in probability, increase in consequences, and reduction in the margin of safety. The philosophy and implementation of their approach are discussed.

16113 **PROCESS - a source term calculation program for the PC.** Gil, T.K.; Hopkins, B. (Bechtel Gaithersburg, VA). *Transactions of the American Nuclear Society;* **53**: 419-421(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

PROCESS is a computer program that calculates radioisotope source terms resulting from various operations used in nuclear power plants. These generated source terms are then used in a shielding computer code called PIPEND which calculates the shielding required to assure protection against radiation. The major objective of development of a personal computer (PC) version of PROCESS was to reduce cost and time incurred during source term and shielding calculations. A portable IBM-PC or its compatibles allow these calculations at any time and location. Also, its user-friendly and simple operation allows one to become quickly familiar with the usage of the program.

16114 **MICROSHIELD - a microcomputer program for analyzing dose rate and gamma shielding.** Negin, C.A. (Grove Engineering). *Transactions of the American Nuclear Society;* **53**: 421-422(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Until recently, dose rate (exposure rate) and shielding effectiveness calculations have been conducted by specialists, either within an organization or by consultants. Now, the capability to perform these calculations is available to engineers and health physicists with desktop computers. MICROSHIELD is one program that provides this capability. The overall objective in creating MICROSHIELD was to provide a program that would relieve a user from the need to be a shielding analysis expert or to be familiar with how microcomputers operate. The goal was to allow a person to focus on the decision for which an analysis is required instead of on the analysis itself. The purpose of this paper is to describe some of the means by which this objective was achieved.

16115 **Reflection of gamma radiation in a spherical concrete-walled room.** Lahti, G.P.; Johnson, W.J.; Rich, J.M. (Sargent & Lundy, Chicago, IL). *Transactions of the American Nuclear Society;* **53**: 423-424(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A correlation of the in-containment monitor reading and airborne radioactivity within containment is useful in assessing radiological consequences of postulated power plant accidents. One accident of concern in the loss-of-coolant accident. A design-basis release from the core to the containment can be postulated and a time-dependent in-containment monitor response due to direct radiation can then be calculated using a fast-running point kernel code, but this calculation provides no estimate of wall-scattered radiation. The question presently addressed is the following: Is the wall-scattered radiation of sufficient importance to preclude use of the point-kernel method in this calculation? This study shows that a point kernel code can be used to calculate in-containment dose rates with errors of $<30\%$.

16116 **Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel.** Rainisch, R.; Fricke, V.R.; Atkins, P.G. Jr. (Burn & Roe, Middletown, PA). *Transactions of the American Nuclear Society;* **53**: 424-426(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The March 28, 1979, accident at Three Mile Island Unit 2 (TMI-2) resulted in a significant mass of fuel debris (10 to 20 tonne) slumping into the bottom head of the reactor pressure vessel (RPV). It has been suggested that the lower shell could have been breached as a result of molten fuel slumping into the bottom head, which may have allowed fuel to escape into the primary shield cavity under the RPV. The primary shield cavity under the RPV was scanned to characterize the cavity, to determine if a significant deposit of fuel debris (i.e., 70 kg of UO_3) is within the cavity confines, and to support the characterization of the reactor building basement and the search for fuel outside the reactor coolant system. Prior to the reference scanning, key indicators, such as reactor coolant system pressure during and after the accident and measurements of in-core thermocouple lengths did not support the hypothesis of fuel escaping from the bottom of the vessel. However, no conclusive data existed on the lower head conditions and whether or not fuel escaped from this region. The scanning effort does not support the theory that a large quantity of fuel escaped through the RPV lower head.

16117 **Influence of gamma-ray skyshine on nuclear facilities design.** Ohta, M.; Tsuji, M.; Kimura, Y. (Toyo Engineering Corp., Tokyo, Japan). *Transactions of the American Nuclear Society;* **53**: 426-427(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In safety analysis of nuclear facilities, skyshine dose rate at site boundary is one of the most important shielding design problems. For nuclear power stations in Japan, the skyshine dose rate at the site boundary has been specified not to exceed 5 mR/yr by the authorities, including total dose contribution from all structures on site, and this guide is commonly applied to other nuclear fuel cycle facilities. Therefore the design criterion dose of each structure on site is, considering plot planning, shielding condition, and so on, defined as a value <5 mR/yr. The purpose of this study is to investigate how skyshine dose standards or other factors have an influence on the design of nuclear facilities, in a parametric survey of gamma-ray skyshine.

16118 **Operational radiation protection for reducing cumulative exposure at a boiling water reactor.** Parkyn, J.D. (Dairyland Power, La Crosse, WI). *Transactions of the American Nuclear Society;* **53**: 427(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The La Crosse boiling water reactor (BWR), due to the very small staff size, has had to develop, since mid-1982, a very vigorous dose reduction program in the operational area. This program has led to the involvement of operators and shift supervisors, as well as other management and bargaining union personnel in developing suggestions for both increasing the accuracy of operational dose assessment and in reducing total dose accumulation from operational activities. While there will continue to exist fluctuations in annual exposures based on maintenance requirements and equipment availability, it is very evident that an aggressive program of control at the La Crosse BWR has resulted in a significant annual reduction in total exposure. The personnel approach to radiation protection has been to enhance the use of dosimeters, particularly rate meters, to preplan jobs to a greater degree, and to be constantly aware of low-level back-ground radiations even when such observations lead to the removal and relocation of a significant amount of equipment.

16119 **Summary of safety relief valve position indication systems.** Cybulski, D.S.; Walter, J.F. *Transactions of the American Nuclear Society;* **53**: 438-439(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Mainly as a result of the Three Mile Island-2 (TMI-2) incident, the US Nuclear Regulatory Commission's Regulatory Guide 1.97 instituted criteria recommendations for monitoring variables to: 1. provide information required to permit the operator to take preplanned manual actions to accomplish safe plant shutdown; 2. determine whether...systems important to safety are performing their functions...; and 3. provide information to the operators that will enable them to determine the potential for causing a gross breach of the barriers to radioactivity release.... This report surveys the methodologies employed in nuclear plants to monitor Type D variables as referred to in Regulatory Guide 1.97. Type D are those variables that provide information to indicate the operation of individual safety systems and other systems important to safety. The specific Type D variable addressed is safety relief valve (i.e., spring style safety relief valve) position indication. The application criteria for each of the methodologies surveyed is as described in Regulatory Guide 1.97. That is, minimally to provide light indications of closed/not closed positions.

16120 **Identification of test candidates for investigating the survivability of electrical equipment during severe accidents.** Medford, G.T.; Kolaczkowski, A.M. (SAIC, Albuquerque, NM). *Transactions of the American Nuclear Society;* **53**: 439-440(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Associated with the ongoing process of resolving nuclear power plant severe accident issues, an effort was recently completed that investigated the survivability of electrical equipment used to mitigate accidents during representative severe environments. The overall objective of the work was to provide information that could be used to reduce one of the uncertainties in severe accident analyses; i.e., whether electrical equipment used to mitigate accidents could be reasonably relied on while subject to a severe accident environment. This work centered on recommending electrical equipment within a boiling water reactor (BWR)-4 Mark I containment most worthy of survivability testing. The recommendation was based on the equipment's importance to mitigating severe accidents and the environments encountered relative to current equipment qualification requirements. A methodology was established to arrive at this recommendation. The methodology is described.

16121 Ex-core water-level monitor: comparison of computations with LOFT data. Markoff, D.; DeVolpi, A.; Prussin, S. (Univ. of California, Berkeley). *Transactions of the American Nuclear Society;* 53: 441-443(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The unambiguous, easy-to-interpret indication of inadequate core cooling throughout a reactor vessel is considered important to plant safety function. After the Three Mile Island-2 incident, research was undertaken on a variety of means to monitor coolant inventory. However, questions of survivability and uniqueness of response remain, resulting in continued exploration of ex-core methods. This paper reports on a water-level instrument that is situated outside the reactor vessel and is designed to give separate information on the core and downcomer levels at full power and long after scram. An axial array of gamma detectors has been proposed for this application. The apparatus concentrates on detection of high-energy gamma rays produced by neutron capture in hydrogen and steel. Under these conditions, it would be possible to monitor the coolant level from outside the pressure vessel and therefore be survivable under accident conditions; it would not need vessel penetrations, nor would maintenance requirements be excessive. By concentrating on the high-energy gamma rays and by collimating the detectors, background would be reduced. The collimation also permits separate monitoring of downcomer and core liquid-level conditions and allows vertical resolution of coolant inventory and density over the full vessel height.

16122 New time-line technique for station blackout core-melt analysis. Stutzke, M.A. (Florida Power Corp., St. Petersburg). *Transactions of the American Nuclear Society;* 53: 444-445(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Florida Power Corporation (FPC) has developed a new method for analyzing station blackout (SBO) core-melt accidents. This method, created during the recent probabilistic risk assessment (PRA) of Crystal River Unit 3 (CR-3), originated from the need to analyze the interactions among the two-train emergency feedwater (EFW) system, station batteries, and diesel generators (DGs) following a loss of off-site power (LOSP) event. SBO core-melt sequences for CR-3 are unique since the time core-melt commences depends on which DG fails last. The purpose of this paper is to outline the new method of analysis of SBO core-melt accidents at CR-3. The significance of SBO core-melt accidents to total plant risk, along with the efficacy of various methods to reduce SBO risk, are also discussed.

16123 Loss of pressurizer water level during station blackout. Griggs, D.P.; Riggs, B.K. *Transactions of the American Nuclear Society;* 53: 445-446(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Station blackout is the loss of all alternating current (ac) power to both the essential and nonessential electrical buses in a nuclear power plant. The US Nuclear Regulatory Commission (NRC) has proposed a requirement that all plants be capable of maintaining adequate core cooling during station blackout events lasting a specified duration. The NRC has also suggested acceptable specified durations of four or eight hours, depending on individual plant susceptibility to blackout events. In a pressurized water reactor (PWR), the occurrence of a station blackout event results in the functional loss of many plant components, including main feedwater, reactor coolant pumps, the emergency core cooling system, and pressurizer heaters and spray. Nevertheless, PWRs have the capability of removing decay heat for some period of time using steam-driven auxiliary feedwater pumps and the natural-circulation capability of the primary system. The purpose of this investigation is to determine the early response of a PWR to station blackout conditions. In particular, the effect of primary coolant shrinkage and inventory loss on pressurizer level is examined to gain insight into the operational and analytical issues associated with the proposed station blackout coping requirement.

16124 Emergency diesel generator reliability at US nuclear power plants. Wyckoff, H.L. (Electric Power Research Institute, Palo Alto, CA). *Transactions of the American Nuclear Society;* 53: 446-447(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

During the past several years the nuclear power industry and the US Nuclear Regulatory Commission (NRC) have had efforts under way to better determine the risk from station blackout at nuclear power plants. Two of the important elements of this effort have been to accurately determine the reliability of off-site and of emergency on-site alternating current (ac) power sources. With respect to off-site alternating current (ac) power sources. With respect to off-site power, the Electric Power Research Institute (EPRI) has prepared an accurate data base of events where all off-site power was lost at US nuclear plants and is updating it on a continuous basis. It shows that overall, off-site power reliability is excellent. During the three years 1983, 1984, and 1985, there were 0.075 losses per site year of all durations and only 0.023 losses per site year that were longer than 30 min. The relative unreliability performance of the start phase compared to the load-run phase merits special note. Load-run unreliability is consistently higher than start-phase unreliability. The spread ranges from a factor of 2 to a factor of 4.

16125 Determination of station blackout frequency-duration relationships. Griggs, D.P.; Riggs, B.K.; Balakrishna, S. *Transactions of the American Nuclear Society;* 53: 447-449(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Station blackout is the loss of all alternating current (ac) power to the essential and nonessential electrical buses in a nuclear power plant. This generally involves the loss of redundant off-site power sources and the failure of two or more emergency diesel generators (EDGs). The US Nuclear Regulatory Commission (NRC) has proposed requiring all commercial reactors to have the capability of coping with a station blackout of a specified duration. The NRC has also proposed 4 or 8 h as acceptable durations, depending on plant susceptibility to the occurrence of station blackout events. Analyses were performed to determine expected station blackout frequencies representative of a majority of domestic nuclear power plants. A methodology based on that developed by the NRC was used. Representative industry data for loss of off-site power (LOOP) events and EDG reliability were used in the analyses.

16126 Modeling of Ge(Li) gamma-ray spectra. Harris, R.D.; Binney, S.E. (Oregon State Univ., Corvallis). *Transactions of the American Nuclear Society;* 53: 166-167(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this work was to develop a model of monoenergetic gamma-ray spectra that were experimentally measured with a Ge(Li) detector counting system. A number of notable investigations have attempted all or part of this task with varying degrees of success. This model was incorporated into the FORTRAN computer program SPECTRA, which can be used to calculate the expected spectrum of gamma-ray sources when it would otherwise be impractical or impossible to measure the actual sources. The calculated and measured spectra for a 1779-keV (^{28}Al) gamma-ray are shown. The model fits the experimental data fairly well. As indicated earlier, this technique can be used to calculate complex gamma-ray spectra mathematically as a linear combination of a series of monoenergetic gamma-ray spectra. For example, program SPECTRA has been used to calculate the fission product spectrum of the reactor coolant after a pressurized water reactor (PWR) design basis accident.

16127 Integrated defueling system for Three Mile Island Unit 2. Brown, D.A.; Gallagher, R.E.; Rider, R.L. (Bechtel Western). *Transactions of the American Nuclear Society;* 53: 502-503(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The unique clean-up requirements of Three Mile Island Unit 2 have posed first-of-a-kind challenges for the equipment, tools, and operators involved in the defueling effort. Various equipment components and specialty remote tools were designed as an integrated defueling system to provide a means of safely working above the reactor and removing core debris. The basic defueling system consists of support equipment and specialty remote tools for specific operations. This paper describes the different equipment and tools, and explains the key interfaces and features of the integrated defueling system.

16128 **Design rationale for a remote work vehicle.** Whittaker, W.L. *Transactions of the American Nuclear Society;* 53: 503-504(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The remote work vehicle (RWV) is a mobile, teleoperated, electrohydraulic robot designed for aggressive, radiological decontamination work. The RWV performs tasks such as washdown, sampling, material packaging and transport, surfacing, and demolition. This paper discusses the design rationale that shaped the development of the RWV with respect to capability, reliability, operability, decontaminability, extensibility, and maintainability. To meet an important subset of nuclear damage recovery tasks, the design embraced these often competing ideals.

16129 **Robotics development at TMI-2.** Bengel, P.R.; Giefer, D.L.; Levesque, R.G. (GPU Nuclear Corp., Middletown, PA). *Transactions of the American Nuclear Society;* 53: 504-505(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A remote reconnaissance vehicle (RRV) was initially developed to visually and radiologically survey the Three Mile Island Unit 2 (TMI-2) reactor building basement, which is not accessible to workers because radiation levels are extremely high (i.e., 10 to 1000 R/h). By mid-1985, the RRV had completed surveillance and sludge sampling missions that demonstrated its utility and suggested that the RRV could be modified to perform more aggressive sampling and decontamination work. This paper discusses the design criteria and operational experiences that GPU Nuclear Corporation (GPUNC) has had with expanding the use of the RRV to take concrete core bores, perform gross flushes, and remove sediment from the reactor building basement. The basic RRV unit is shown. This six-wheeled vehicle weighs ~224 kg (600 lb) and is powered by two 1/2-hp motors. Its power, control signals, and video transmissions pass through a thin-layered cable that winds around a reel located on the RRV.

16130 **Operational experiences with a remote core-boring device.** Kreider, K.A.; McGarry, J.J. (Bectel, Middletown, PA). *Transactions of the American Nuclear Society;* 53: 505-506(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The 1979 accident at Three Mile Island Unit 2 (TMI-2) dispersed fission products throughout the plant. Radiological surveys taken in the reactor building in 1982 indicated that a substantial portion of that contamination was embedded in the nuclear-grade coatings used to paint structural surfaces. The loss-of-coolant accident resulted in the discharge of highly radioactive water from the reactor coolant system into the reactor building basement (elevation 282 ft, 6 in.). The water in the basement reached a height of ~8 ft, exposing all submerged surfaces to soluble contaminants. This water remained for ~18 months until most of it was removed and processed via the submerged demineralizer system. As decontamination efforts progressed it was deemed necessary to obtain wall core samples from the basement to determine the depth of contaminant penetration into the concrete. These data would in turn aid in planning and selecting various decontamination methods for the 282-ft, 6-in, elevation walls. This paper describes the use of a teleoperator to obtain core-bore samples from the walls of the TMI-2 reactor building's 282-ft, 6-in. elevation. The teleoperator extracted core-bores from a hostile environment with general area radiation levels of ~66 R/h, hot spots of 1130 R/h, and high levels of surface contamination.

16131 **Tomorrow's mobile robots in today's nuclear power plants.** McDermott, K.J.; Pavelek, M.D. II; Roman, H.T. (New Jersey Institute of Technology, Newark). *Transactions of the American Nuclear Society;* 53: 507-(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A primary motivation for utilizing robots in nuclear power plants is maintenance economics and the nuclear industry's concern with reducing personnel radiation exposure to as low as reasonably achievable as recommended by the US Nuclear Regulatory Commission (NRC). Recent studies by Battelle Columbus Laboratories, the Electric Power Research Institute, the NRC and others indicate that robots for surveillance and inspection can be retrofitted into existing boiling water reactor and pressurized water reactor plants, but economics must be evaluated on a case-by-case, site-specific basis, because nuclear power plants in the US are usually different in design. Application areas or robot functions being considered are broad and range from primary containment inspection, reactor maintenance, routine health physics tasks, and various operation and maintenance procedures, to facility decontamination and decommissioning, and post-accident recovery such as at Three Mile Island Unit 2. This paper will discuss the general use of robotic devices in nuclear power plants, the pioneering use of robotics technology at Three Mile Island nuclear power plant, and the field testing of mobile robots at Public Service Electric and Gas Company's Salem and Hope Creek nuclear plants.

16132 **Oyster Creek RETRAN model benchmark to pressure and level perturbation tests.** Alammar, M.A. (GPU Nuclear Corp., Parsippany, NJ). *Transactions of the American Nuclear Society;* 53: 530-531(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

As part of GPU Nuclear's program to establish an in-house reload capability for Oyster Creek, the RETRAN-02 MOD4 SPL Computer Code has been chosen to analyze Chapter 15 Final Safety Analysis Report transients. To qualify Oyster Creek RETRAN model, a series of startup tests has been chosen to benchmark the model. Two of those tests, involved water level and vessel pressure perturbations at 100% power. Both tests were analyzed using point kinetics and one-dimensional kinetics with no noticeable impact on level or pressure. A small impact was noticed on power but was thought to be of minor significance. This is because for such mild transients the neutron flux shape function does not change appreciably throughout the transient.

16133 **Correlation for predicting reactor power during a BWR ATWS.** Chexal, B.; Layman, W. (EPRI, Palo Alto, CA). *Transactions of the American Nuclear Society;* 53: 531-532(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An anticipated transient without scram (ATWS), while of low probability, has received much attention because of its potentially serious consequences. Under certain ATWS sequences for a boiling water reactor (BWR), it would be desirable to reduce system power, particularly where the primary system has been isolated by closure of all main steam isolation valves and is discharging steam through its safety/relief valve system to the suppression pool. Reducing reactor power increases the time available to shut down the reactor by minimizing the heat dumped to the suppression pool and thereby helping to keep the suppression pool temperature and the containment stresses with limits. This paper describes the correlation developed to provide the degree of power reduction which can be achieved for a BWR during ATWS conditions by intentionally reducing the system coolant inventory and pressure. Under proposed emergency procedure guidelines for the ATWS event, the reactor water level would be lowered to reduce system power. The correlation is based on three-dimensional quasi-static analysis based on Electric Power Research Institute computer codes NATBWR and verified by the transient code RETRAN-02.

16134 **Modifications and assessment of rewetting correlations for light water reactor system analysis.** Hassan, Y.A. (Texas A & M, College Station). *Transactions of the American Nuclear Society;* 53: 537-539(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The qualitative aspects of reflood heat transfer in the system codes [e.g., RELAP5/MOD2, TRAC-PF1/MOD1, COBRA-TF, etc.] can be represented with a generalized boiling curve. The anchor points used to specify the boiling curve are the critical heat flux (CHF) temperature (T/sub CHF/) and the minimum flow boiling temperature (T/sub min/). The cooldown during the quenching process is affected by the minimum film boiling heat flux. This aspect of the quenching process has not been studied as much as the CHF phenomenon. The purpose of this paper is to compare several rewetting correlations. These correlations were implemented in a special version of RELAP5/MOD2 computer code. Good comparison between several FLECHT-SEASET data and predicted rewetting temperatures was obtained when a new modified formulation of Henry rewetting correlation was used to account for the mass rate dependence.

16135 **Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding.** Analytis, G.T.; Richner, M. (EIR, Wuerenlingen, Switzerland). *Transactions of the American Nuclear Society;* 53: 540-541(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Analysis of very low flooding rate reflooding experiments and one boiloff experiment in the 33 electrically heated rod bundle NEPTUN at EIR with RELAP5/MOD2/36.02 has shown that the code grossly overpredicts the liquid carryover. Similar results have been reported in the analysis of a large number of boiloff experiments in NEPTUN with TRAC-BD1/MOD1. In this case, the differences between measurements and predictions were attributed to the large bubble/slug interfacial shear in TRAC-BD1 and excellent agreement with the measurements was achieved by implementing in this code a slightly modified version of a new bubbly/slug interfacial shear correlation developed for rod bundles. As far as reflooding is concerned, one of the most crucial parameters for the correct prediction of the rod surface temperature histories is the interfacial shear f/sub i/ in the different flow regimes; it is precisely this term that will largely determine the liquid fraction at a certain axial elevation, and the liquid carryover. In the paper, the authors outline the implementation of the new bubble/slug f/sub i/ correlation in RELAP5/MOD2/36.02 and assess its influence in the liquid carryover in the analysis of low flooding rate experiments in NEPTUN.

16136 **Experimental and theoretical investigation of a phase-change front-prediction method.** Chun, M.H.; Choi, H.O.; Kim, Y.S. *Transactions of the American Nuclear Society;* 53: 541-543(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The phenomena of liquid-solid phase change have been extensively studied for the latent heat-of-fusion energy storage design, the assessment of molten-fuel relocation following hypothetical core-disruptive accidents in liquid-metal fast breeder reactors, casting of metals, and desalination of water. The major characteristics of the melting and freezing problems include the movement of a phase boundary by the diffusion of energy or mass, and the nonlinearity associated with the moving phase boundary extremely complicate its analysis. The purpose of the present study is to examine the usefulness of the proposed method of the phase-change-front prediction based on the optimization technique by application to a special case. This paper describes a combined experimental and theoretical study of the phase change front when solidification of an initially stagnant superheated molten fluid occurs on the outside wall of a convectively cooled vertical tube show.

16137 **Model for stratified flow in a CANDU reactor header manifold.** Gulshani, P. (AECL, Sheridan Park, Ontario). *Transactions of the American Nuclear Society;* 53: 553-555(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The core of the Canada deuterium uranium (CANDU) reactor consists of many horizontal pressure-tube-type fuel channels each connected by feeder pipes to common inlet and outlet horizontal headers above the core. The feeder nozzle connections at the header are at different elevations around the header circumference. The headers are connected to the steam generators and the emergency-core-cooling (ECC) system. For a small-break loss-of-coolant accident with delayed or unavailable ECC, two-phase (steam-water) coolant is eventually predicted in the inlet header as the primary inventory decreases. The possibility of coolant stratification in the header resulting in steam cooling of the fuel channels with feeder nozzles at the header in the steam phase needs to be studied. Tests are ongoing in the full-scale header facility at Westinghouse Canada to provide experimental information on the header manifold flow behavior. A series of single-phase water and two-phase steam-water, steady-state header injection tests was recently done, and results to data are discussed.

16138 **Assessment of the heat transfer models in the TRACB02 code.** Chu, K.H.; Andersen, J.G.M.; Shiralkar, B.S. (General Electric Co., San Jose, CA). *Transactions of the American Nuclear Society;* 53: 555-556(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

TRACB02 is a computer code developed at General Electric Company (GE) in a collaboration with the Idaho National Engineering Laboratory for best-estimate analysis of the thermal-hydraulic conditions in a boiling water reactor (BWR). This development effort was jointly funded by the US Nuclear Regulatory Commission/Electric Power Research Institute/GE. TRAC features a high degree of modularity to allow for the simulation of almost any system. The basic physical phenomena are described by the conservation equations for mass, momentum, and energy. The heat transfer mechanisms modeled include single-phase convection, nucleate and sub-cooled boiling, boiling transition and rewet, post-dryout heat transfer, thermal radiation, and interfacial heat transfer to droplets, bubbles, and films. The heat transfer models are tied to the interfacial shear model through a consistent flow regime map. The assessment was performed by simulating a set of separate effects tests with TRACB02 and then comparing the results with data. Results of the assessment studies are summarized.

16139 **Corium droplet size in direct containment heating.** Sienicki, J.J.; Spencer, B.W. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* 53: 557-558(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

For those light water reactor severe accident sequences in which molten corium is postulated to melt through the reactor pressure vessel (RPV) lower head at elevated primary system pressure and enter the cavity region beneath the vessel, the flow of corium from the RPV will be followed by a sustained high-pressure blowdown of steam and hydrogen through the breach remaining in the vessel. The gases flowing from the breached vessel constitute a source of driving forces capable of dispersing corium from the cavity as droplets into other parts of the containment. An important issue is the fraction of the dispersed corium thermal and chemical energy which may be transferred directly to the containment atmosphere. An important determinant of the extent of direct containment heating is the size of the corium droplets which are dispersed into the containment atmosphere. An analysis is presented here of the mass median droplet sizes in the Argonne National Laboratory CWTI-13 and CWTI-14 reactor material-direct containment heating experiments as well as the Sandia National Laboratory SPIT-19 thermite test. The observed median droplet diameters are shown to be in good agreement with a correlation for the drop size in ordinary annular flow, and a droplet size prediction is carried out for the reactor system.

16140 **Application of a direct-heating model to the Sandia SURTSEY tests.** Pong, L.C.; Huhtiniemi, I.; Corradini, M.L. (Univ. of Wisconsin, Madison). *Transactions of the American Nuclear Society;* 53: 558-559(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the event of a severe light water reactor accident which involves fuel melting at high primary system pressures the direct heating of the containment atmosphere is an important physical process to consider. This would occur as the fuel, which has slumped from the core into vessel lower plenum, fails the reactor pressure vessel (RPV) wall and is discharged under high pressure into the reactor cavity below the vessel. As the fuel and high-pressure gases are discharged from the RPV the fuel can be entrained in the gas flow and dispersed as droplets into the containment atmosphere. The heating of the atmosphere by the sensible heat of the fuel droplets as well as possible chemical reactions of the fuel with the gases may threaten containment integrity. A series of experiments is being planned at Sandia (SURTSEY) to understand this direct heating phenomenon. In the paper the authors present a pre-test calculation of the first SURTSEY test (DCH-1) using a recently developed direct heating model (DIRHET). This model will be compared to the SURTSEY test data to verify its applicability and is being used in scoping calculations for containment direct heating.

16141 **Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1.** Ginsberg, T.; Tutu, N. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 559-601(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

High-pressure melt ejection from pressurized water reactor (PWR) vessels has been identified as a severe core-accident scenario which could potentially lead to early containment failure. Melt ejection, followed by dispersal of the melt by high-velocity steam in the cavity beneath the PWR vessel could, according to this scenario, lead to rapid transfer of energy from the melt droplets to the containment atmosphere. This paper describes DHCVIC, an integrated model of the thermal, chemical, and hydrodynamic interactions which are postulated to take place during high-pressure melt ejection sequences. The model, which characterizes interactions occurring within the reactor cavity, as well as in the containment vessel (or building), is applied to prediction of the Sandia National Laboratory (SNL) SURTSEY Test DCH-1 and a (post-test) prediction of that test is made.

16142 **Heat radiation through steam in direct containment heating.** Condiff, D.W.; Cho, D.H.; Chan, S.H. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 561-562(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Current risk studies of light water reactors include analysis of phenomena associated with severe accident sequences. These sequences include low probability events in which molten core materials escape in high-system-pressure situations into regions below the reactor pressure vessel, are fragmented into droplets, and swept by blowdown steam (and hydrogen) into the containment atmosphere in sufficient atmosphere. The dispersed molten core droplets could release their latent and sensible heats as well as chemical oxidation energy directly to containment atmosphere in sufficient quantities to cause overpressurization. This study extends understanding of such direct containment heating phenomenology by examining the disposition of heat radiated from the dispersed high-temperatures droplets.

16143 **Surry severe-accident containment load calculations using HMC.** Pong, L.C.; Corradini, M.L.; Moses, G.A. (Univ. of Wisconsin, Madison). *Transactions of the American Nuclear Society;* **53**: 562-563(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In a nuclear reactor, the containment represents the final barrier to fission product release following a severe accident. The timing and manner of containment loading are important in determining if a failure occurs and the magnitude of radioactivity release. A variety of computer models have been developed to analyze severe accidents and in particular the containment. Recently, physical processes are of interest involving fuel/coolant interactions, hydrogen combustion, and direct heating following reactor pressure vessel (RPV) breach with containment feedback. Based on this need the HMC code was developed. In this paper the authors discuss scoping calculations using HMC to investigate containment loads for the Surry reactor under a variety of parametric boundary and initial conditions (low and high RPV pressures) at a time of vessel breach.

16144 **Containment loads due to hydrogen combustion.** Berman, M.; Lee, J.H.S. (Sandia National Labs., Albuquerque, NM). pp 126-129 of Proceedings of the international conference on containment design. Black, R.K. Toronto, Ontario; The Canadian Nuclear Association (1984). (CONF-840628—). Contract AC04-76DP00789.

From International conference on containment design; Toronto, Ontario, Canada (17 Jun 1984).

Certain results of a research program on the impact of hydrogen combustion in nuclear reactor safety carried out at Sandia National Laboratory and McGill University are reviewed in this paper. In particular, investigations of hydrogen diffusion flames, closed volume combustion of hydrogen and the influence of turbulence, flammability limits of hydrogen-air-steam mixtures, high speed deflagrations and detonations, and computer modelling of turbulent flame accelerations are described.

16145 **SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions.** Borgwaldt, H.; Gulden, W. (Kernforschungszentrum Karlsruhe, Postfach 3640, D-7500 Karlsruhe). pp 663-686 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

SSYST is a code-system for analyzing transient fuel rod behaviour under off-normal conditions, developed conjointly by the Institut fur Kernenergetik und Energiesysteme (IKE), Stuttgart, and Kernforschungszentrum Karlsruhe (KfK) under contract of Projekt Nukleare Sicherheit (PNS) at KfK. The main differences between SSYST and similar codes are an open-ended modular code organization, and a preference for simple models, wherever possible. While the first feature makes SSYST a very flexible tool, easily adapted to changing requirements, the second feature leads to short execution times. The analysis of transient rod behaviour under LOCA boundary conditions takes 2 min cpu-time (IBM-3033), so that extensive parametric studies become possible. This paper gives an outline of the overall code organisation and a general overview of the physical models implemented. Besides explaining the routine application of SSYST in the analysis of loss-of-coolant accidents, examples are given of special applications which have led to a satisfactory understanding of the decisive influence of deviations from rotational symmetry on the fuel rod perimeter.

16146 **A model for fission product distribution in CANDU fuel.** Muzumdar. (Nuclear Studies and Safety Dept., Ontario Hydro, 700 University Avenue, Toronto, Ontario). pp 559-574 of Water reactor fuel element performance computer modelling. Gittus, J. New York, NY; Elsevier Science Pub. Co. Inc. (1983).

This paper describes a model to estimate the distribution of active fission products among UO/sub 2/ grains, grain boundaries, and the free void spaces in CANDU fuel elements during normal operation. This distribution is required for the calculation of the potential release of activity from failed fuel sheaths during a loss-of-coolant accident. The activity residing in the free spaces ('free' inventory) is available for release upon sheath rupture, whereas relatively high fuel temperatures and/or thermal shock are required to release the activity in the grain boundaries or grains. A preliminary comparison of the model with data from in-reactor sweep-gas experiments performed in Canada yields generally good agreement, with overprediction rather than unprediction of radiologically important isotopes, such as I/sup 131/. The model also appears to generally agree with the 'free' inventory release calculated using ANS-5.4.

25 ENERGY STORAGE

2505 Flywheels

16147 (NP—7770051) Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems. Guentensperger, W. (Eidgenoessische Technische Hochschule, Zurich (Switzerland)). 1984. 188p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE87770051.

In the first part of this thesis, the basics of kinetic energy storage systems are examined with regard to the specific requirements of an electric driving machine. This machine must be able to have a wide range of speed, high peak-power capability and small idling losses. Because of the high rim-velocity of the flywheel, the rotating system is working at reduced ambient pressure. In this case the machine has to be equipped with a separate cooling system. The reluctance- and the homopolar machine have been proposed often before for flywheel drives. Through a special arrangement (rotating magnetic circuit and stationary winding in the air gap), it is possible to eliminate the iron losses of a permanent-magnet synchronous machine. The main part of this investigation consists of the calculations for the development of such a permanent synchronous machine. It is devided in the following sections: Stress analysis of the rotating part; calculation of the magnetic field and optimizing the geometry of the machine; optimizing the form of the winding; design of the cooling-circuit; calculation of the electrical parameters and efficiency of the machine. The details of the constructions are given in a separate chapter. The machine was tested in the laboratory to verify the calculations. The results gave many indications for further development of such a machine. Measurements and interpretations were made with a digital computer.

2509 Batteries

REFER ALSO TO CITATION(S) 16234, 16253

16148 (CONF-861068—15) Battery thermal modeling: The methodology and applications. Lee, J. (Argonne National Lab., IL (USA)). 24 Oct 1986. Contract W-31109-ENG-38. 10p. NTIS MF A01; 2; GPO Dep. File Number DE87004865.

From Electrochemical Society fall meeting; San Diego, CA, USA (19 Oct 1986).

Mathematical modeling has been an efficient and powerful tool for evaluating thermal behavior of batteries and electrochemical cells. In this paper, the methodology and applications of thermal modeling in various battery systems are reviewed. Potential needs and extensions of battery thermal modeling are discussed.

16149 (CONF-8610122—13) Temperature effects on nickel/iron battery characteristics. DeLuca, W.H.; Tummillo, A.F.; Biwer, R.L.; Hornstra, F.; Christianson, C.C. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02. File Number DE87004930.

From 8. international electric vehicle symposium ↑; 0.

The performance of an improved Ni/Fe electric vehicle battery applications was measured at ambient temperatures of 0, 25 and 50°C for a range of overcharge levels (3 to 80%), open-circuit stand times (0 to 4 h), and charge (1 to 6 h) and discharge (1 to 3 h) rates. Charges and discharges were also performed at different battery operating temperatures to differentiate the effects of temperature on battery charge acceptance and available discharge capacity. The results show that the discharge capacity increases with an increase in the operating temperature, but that the charge acceptance is maximal at 25°C.

16150 Lithium alloy/iron sulfide batteries. Nelson, P.A.; Shimotake, H. (Chemical Technology Div., Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439-4837). pp 150-154 of Progress in batteries and solar cells. Cleveland, OH; JEC Press Inc. (1987). Contract W-31-109-ENG-38.

Lithium alloy/FeS cells with a theoretical capacity of 200-400 Ah have been developed. These cells have achieved high specific energy (100 Wh/kg), high power (150 Wh/kg), and long life (1,000 cycles). Electrode experiments and design studies indicate the possibility of improving specific energy and power by 50 to 100 percent and, perhaps, retaining cycle life.

16151 Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system. Levy, S.C.; Herrig, D.M. (Exploratory Batteries Div., Sandia National Labs., Albuquerque, NM 87185). pp 98-100 of Progress in batteries and solar cells. Cleveland, OH; JEC Press Inc. (1987).

Sandia National Laboratories is using Li/SO/sub 2/ batteries in an application requiring five years of continuous operation with a high degree of reliability. To meet the application requirements, commercial Li/SO/sub 2/ cells were modified to eliminate parasitic corrosion reactions leading to premature failure. The Sandia modified Li/SO/sub 2/ cells are manufactured by two suppliers and have shown a significant improvement in multi-year discharges over the standard commercial design. However, variations are observed in cell performance within and between individual lots. To improve the overall reliability of each lot, 100% acceptance tests are performed. These tests consists of open circuit voltage, weight and dimensional measurements. A study is underway to define other nondestructive measurements which may be used to predict cell performance. To speed up the acceptance process and further improve the product reliability by eliminating human errors, a robotic workstation was conceived.

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 15362, 16170

16152 (ESC-WR—86-18) Research on and applications of non-linear costs functions in the Dutch energy models SELPE and DELPE. Van Dasler, H.C. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). Aug 1986. 175p. (In Dutch). Energie Studie Centrum ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

The Energy Study Centre of the Netherlands Energy Research Foundation ECN has developed a long term energy model SELPE (Static ESC Linear Programming Energy model). Characteristic of this model is the assumption that all relations are linear. For certain cost categories this is only a first order approach. A non-linear approach has been made for extraction costs functions of energy sources as well as for investment costs functions of energy processes. Calculations have been executed with the adjusted model SELPE and with the dynamic version of SELPE, called DELPE. If non-linear investment costs functions were used calculations have been done with the help of mixed integer programming. Calculation results turned out to be realistic and useful. 16 refs.

16153 (NP—7750866) Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary. Casser, E.; Goy, G.C.; Labahn, K.D.; Wittke, F.; Ziesing, H.-J.; Schmitt, D.; Ciesiolka, J.; Gommersbach, M.; Schulz, W.; Suding, P.H. (Deutsches Inst. fuer Wirtschaftsforschung, Berlin (Germany, F.R.); Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.; Rheinisch-Westfaelisches Inst. fuer Wirtschaftsforschung, Essen (Germany, F.R.)). Apr 1982. 37p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750866.

The aim of the detailed investigations was to analyse and assess the energy policy options, by which the structure of the energy supply can be improved. Aids to decision making were worked out from selected, specially relevant examples. Conditions and consequences are shown, and also the possible solutions in the overall context. The questions arising from the previous development and present structure of the energy supply system in West Germany are dealt with first. After the analysis of structural development (final energy consumption of households, traffic, small users, industry), there is an assessment of the main characteristics of

this development against the background of energy policy aims with the following aspects: security of supply, rational, economical and environmentally acceptable use of energy, adaptability of the existing energy system to changed conditions of energy supply. (HWJ).

16154 **(ORNL—5947) Energy division: Annual progress report for period ending September 30, 1982.** (Oak Ridge National Lab., TN (USA)). Jun 1983. Contract W-7405-ENG-26. 199p. NTIS, PC A09/MF A01. File Number DE83015056.

A separate abstract was prepared for each of the six sections of the report for the Energy Data Base. (RCK)

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 15637, 15660, 16152, 16154, 16167, 16489, 17505, 17590, 17592

16155 **(DOE/EIA—0206(85)) Performance profiles of major energy producers, 1985.** (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). 15 Jan 1987. 147p. NTIS, PC A07/MF A01 - GPO; 1; GPO Dep. File Number DE87004814.

Pursuant to Section 205(h)(2) of the Department of Energy Organization Act, the Energy Information Administration, through Form EIA-28, has collected financial information and other measures of energy-related business efforts and results for 22 major energy companies on a uniform, segmented basis (the merger of Cities Service with Occidental Petroleum in 1982 reduced the number of reporting companies from 26 to 25 beginning in 1983, and the 1984 mergers of Chevron with Gulf Oil, Mobil with Superior Oil, and Texaco with Getty Oil reduced the number of reporting companies to 22 beginning with the 1985 reporting year). Comparability of information across energy lines of business is unique to this reporting system. For example, petroleum activities can be compared to activities in other energy lines of business or nonenergy areas, and domestic activities can be contrasted to foreign activities. The purpose of this publication is to examine year-to-year developments in the operations of the 22 major US energy-producing companies on a corporate level, by major line of energy business, and by major functions within each line of business. Although the focus is on developments in 1985, important trends over the 1974 through 1985 period are also featured. Economic performance, in financial and physical dimensions, continues to serve as a significant factor in evaluating past decisions and guiding future options in the development and supply of energy resources. The information contained in this report is intended to promote an understanding and a critical review of the possible motivations and apparent consequences of investment decisions by some of the largest corporations in the energy industry. The information is intended for use by the Congress, Government agencies, industry analysts, and the public.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 15599, 15643, 15648, 16154, 16225, 16226, 16488, 16701, 16727, 16770, 16771

16156 **(AD-A—174346/7/XAB) Hazardous-waste management: a descriptive study. Master's thesis.** Drewett, G.M. (Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA). School of Systems and Logistics). Sep 1986. 95p. (AFIT/GEM/DEM—86S-9). NTIS, PC A05/MF A01.

The increased emphasis and enforcement of the RCRA regulations by the US EPA has prompted AF managers to reevaluate base-hazardous waste management activities. This research effort provides management with a profile of the current state of affairs of waste management within the Air Force community. This profile provides the necessary baseline data for managers to develop and support future hazardous-waste-management initiatives. A census of all CONUS base environmental Coordinators was used to identify existing base hazardous-waste-management practices. The data obtained in this research effort identified three major problem areas: 1) Inadequate environmental planning, 2) Inadequate waste-storage facilities, and the 3) Lack of EPC involvement in the base's hazardous-waste-management program. Additional research into the underlying reasons for this lack of EPC support is recommended.

16157 **(NP—7770046) Problems of decision-making in the fields of biology and ecology under the aspect of environmental policy.** Krause, A. (Freiburg Univ. (Germany, F.R.). Forstwissenschaftliche Fakultaet). Jun 1984. 329p. (In German). NTIS (US Sales Only), PC A15/MF A01. File Number DE87770046.

This study looks into political and administrative mechanisms and effects in the classical area of 'Conservation of nature and care of the landscape' for the area of the Federal Republic of Germany between 1969 and 1980. The overall question asked in this respect is: In how far have governments succeeded to get away from a policy of merely repairing damage and adopted a concept of future-oriented biological and ecological preventive care. This is followed by the questions: How to combine influences and factors in this areas in such a way that popular measures and long-term declarations of intent are translated into practice so as to guarantee a continuous development of environmental policy strategies. The author comes to the conclusion that a special governmental agency ought to be set up whose staff is organized in working teams for each region and is thus able to fruitfully combine the political objectives with the claims of the people. As this agency would not be a part of any local government it would not be tied down by short-term political vested interests but could make decisions which do justice to the subjects at stake. Conservation of nature and care of the landscape will be efficient only if there are sufficient instruments, clearly formulated aims, adequate institutions with qualified staff and a general acceptance of the latter. (orig./HSCH).

2904 Natural Resources

REFER ALSO TO CITATION(S) 15599

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 15601, 15638, 15639, 15641, 15647, 15649, 15651, 15656, 15658, 15659, 15660, 15719, 15720, 15723, 15724, 15730, 16167, 16168, 17676, 17678

16158 **(BNL—39110) Brookhaven National Laboratory: Technology transfer report, Fiscal year 1983.** (Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-76CH00016. 54p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005255.

One of Brookhaven's primary missions has been the construction and operation of large facilities for basic research. The Laboratory has always been cognizant of, and has taken pride in, the transfer of technologies associated with the design, construction, operation or utilization of the facilities; and with the technology developed from all of our basic and applied research programs. Although, in the past, the technology transfer process has not been formalized, the technologies developed here have been continuously diffused into the American economy. Some examples are medical isotopes, most notably technetium-99, and much of the early light water reactor technology based upon BNL's work with its first research reactor and with its critical assembly facility. Now the Laboratory has formalized the process and created an Office of Research and Technology Applications (ORTA).

16159 **(Juel-Conf—58) Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings.** Terhorst, W. (comp.). (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Jul 1986. 266p. (In German). (CONF-8607110—). NTIS (US Sales Only), PC A12/MF A01. File Number DE87751309.

From Workshop on petroleum and natural gas in the Kernforschungsanlage Juelich; Juelich, F.R. Germany (1 Jul 1986).

The workshop 'Petroleum and natural gas in the Kernforschungsanlage Juelich' was held at the Nuclear Research Centre Juelich on July, 1 and 2, 1986. It brought together about 60 experts from industry, government departments, universities and research

centres. This workshop entered into a discussion about recent work of the Nuclear Research Centre in various fields related to mineral oil and natural gas. Main topics of this workshop: long term availability of oil and gas, quantitative geology as an advanced method for exploration purposes of hydrocarbons, use of the high-temperature reactor in heavy oil recovery, new horizontally integrated energy systems as competitors to the vertical oil system, the energy alcohol R and D Program of the Nuclear Research Centre Juelich. The program consisted of 14 lectures. The present document presents short manuscripts of these lectures, as well as a list of the speakers and participants.

16160 **(ORNL/PPA—87/1) ORNL trends and balances, 1987-1992.** (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 50p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005282.

A brief overview is given that covers the roles, organization, R and D sponsors, and recent achievements of Oak Ridge National Laboratory. Current R and D programs are described in the areas of nuclear and engineering technologies, advanced energy systems, biomedical and environmental sciences, and basic physical sciences. ORNL's future activities are discussed. (LEW)

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 15491, 15492, 15493, 15494, 15495, 15496, 15497, 15498, 15500, 15501, 15504, 15505, 15507, 15508, 15509, 15510, 15512, 15517, 15518, 15520, 15522, 15526, 15535, 15536, 15542, 15545, 16036, 16598, 17505, 17590, 17591, 17592, 17625, 17626

16161 (CONF-860203—, pp 401) **Measurements and status of a decommissioned experimental reactor - SEFOR.** West, L.; Ragland, C.; Welty, T. (Univ. of Arkansas, Fayetteville). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

The Southwest Experimental Fast Oxide Reactor (SEFOR) was decommissioned (by mothballing) in 1972 after two years of operation. Originally funded by the Southwest Atomic Energy Associates and the AEC, the Na-cooled reactor was operated by General Electric under contract. Although fuel was removed during decommissioning, a considerable amount of radioactive material (primarily Co-60 in activated steel) remains. Several years after decommissioning, ownership was transferred to the UA for long-term health physics monitoring and security. Recent GM counter surveys and smear analyses indicate no significant problems with old liquid and gaseous storage tanks. Residual Na is being examined for activation product inventory. Gamma spectroscopy of soil samples in 1984 raised concern of possible ground contamination in one area, prompting further gamma spectroscopy work. Results of surveys, smear analyses and gamma spectroscopy will be presented for the old reactor vessel, waste storage tanks, soil samples and sodium heat exchangers. SEFOR represents an unusual situation since the present owner (UA) assumed responsibility (at the request of the Arkansas State Health Department) after the facility was mothballed and after the original owner (SAEA) became defunct.

16162 **(DOE/DP/50053—T1) Sensitive nuclear activities in certain free world countries.** (USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of International Security Affairs). 20 Dec 1986. Contract AC01-85DP50053. 39p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87004140.

A concise, ready reference is provided for use in reviewing license applications for exporting to several countries for possible need of referral to DOE. For each country, nuclear explosive and sensitive nuclear activities, such as enrichment, reprocessing, heavy water production, and fabrication of fuel containing plutonium, are listed, as well as the organizations and installations responsible for such activities. Some activities are also included that are not sensitive but are closely related and could easily lead to sensitive activities. The countries covered are: Australia, Belgium, Canada, Denmark, Federal Republic of Germany, France, Greece, Iceland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Turkey, and the United States.

16163 **Nuclear weapons testing fallout: proving causation for exposure injury.** Christoffel, T.; Swartzman, D. (Univ. of Illinois, Chicago). *American Journal of Public Health;* **76**: No. 3, 290-292(Mar 1986).

A recent Federal District Court opinion dealing with exposure of civilians to fallout from atomic bomb testing more than two decades ago provides guidance on how court action may in the future, address this problem. Close to 1200 negligence liability claims have been brought against the US government in the names of individuals who had resided near the Nevada Test Site and who subsequently developed cancer or leukemia. Because of the importance and complexity of the cases, the parties involved mutually agreed to the selection of 24 bellwether cases which then provided a legal and factural pattern against which other cases may be subsequently matched. The trial court's decision announced in Allen vs. United States, concluded that the government had a duty to adequately monitor, warn, and educate the population put at risk by the tests and that it had failed to fulfill its duty. However, it is only through case-by-case decision making, by courts reviewing all of the evidence in specific cases and tailoring results to best fit the specific facts, that equitable solutions can be applied in our optimal number of cases.

16164 **Informing the educators: one of the keys to public acceptance.** Mattox, G.C.; Reynolds, A.B.; Brenizer, J.S. *Transactions of the American Nuclear Society;* **53**: 62-63(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

One of the most difficult barriers to overcome in the task of gaining greater public acceptance of nuclear power is the widespread lack of correct information about the true risks and benefits of nuclear energy. The news media are the most prevalent sources of information for the public but they are highly constrained by the limits of space, time, and reader/viewer interest span in being able to cover this complex subject with any degree of completeness, much less with any degree of accuracy. Another source of information for the general public is the educational system, and while it also has its limitations, they are somewhat different from those faced by the media, and the educational system is generally considered to be a more credible information source than the media. This paper report on three programs undertaken in 1985 and 1986 by the Virginia Section of the American Nuclear Society (ANS) in conjunction with the University of Virginia (UVA), the Virginia State Department of Education, and various nuclear industry participants. Each program had its unique features, successes, an failures. All-in-all, these programs have been reported as being quite successful in helping to reach the public through informing the educators

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 15674

2910 Conservation

REFER ALSO TO CITATION(S) 16154, 16207, 16223

16165 (Juel-Spez—291, pp 101-114) **Energy conservation.** Behnsen, J. (Oldenburg Univ., Germany, F.R.). Jan 1985. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87751334.

Sozialvertraeglichkeit von Energieversorgungssystemen.

In Energy in focus. An intermediate balance of the energy debate.

The paper abstracted points out aspects of energy conservation in private households. Due to the still increasing housing space, the trend of full heating and the still increasing number of household appliances the private household sector is the only one to be expecting an increase of end use energy consumption. The paper discusses feasible ways of energy conservation in private households (e.g. type of housing facilities, type and shape of buildings, thermal insulation, energy conserving buildings).

16166 **(NP—7751299) Consumer energy conservation policies and programmes in Britain.** Gaskell, G.; Pike, R. (Wissenschaftszentrum Berlin (Germany, F.R.). Internationales Inst. fuer Umwelt und Gesellschaft). 1983. 176p. NTIS (US Sales Only), MF A01. File Number DE87751299.

This paper is a selective review of information from a variety of sources concerning consumer energy conservation in the residential sector. Although the technology for greater energy efficiency in this sector is readily available, it is now recognised that the major obstacles to progress are non-technical barriers. Ultimately it is consumers who determine whether energy is used efficiently or not. However, consumers' behaviour and actions are the product of a number of factors, including their personal characteristics, social structures, the nature of energy conservation programmes and the broader policy and regulatory system. Thus, in order to make general recommendations about the direction which future initiatives might take, we present an overview of the development and rationale of present policies, a description and evaluation of some existing and proposed energy conservation programmes and an analysis of the process of intentional social change.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 16152, 16169, 16183

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 15638, 15639, 15641, 15643, 15647, 15651, 15656, 15658, 15659, 16153, 16163

16167 **Energy R & D - A national opportunity.** Anderson, T.D. (Oak Ridge National Lab., Oak Ridge, TN). pp 5-6 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Four years ago we were facing a future of ever-increasing energy prices and threats of oil cutoffs. There was a clear need to build new coal and nuclear power plants to replace those burning oil and gas, and there was broad agreement on the need for alternative sources of liquid fuels including oil from shales and coal. Now we are in the midst of an oil and gas "glut" with declining energy prices, mass cancellations of nuclear power plants and synthetic fuels projects, and a Synthetic Fuels Corporation that seems to be in deep trouble. What happened? Is it, as some politicians say, that the abundance of energy was inevitable once the business of energy was given back to the private sector? Or is it, as some conservationists claim, that our present energy situation is the direct result of improvements in energy efficiency? The fact is that neither position can be supported. Despite very high levels of exploration by private energy companies, the US reserves of oil and gas continue their slow, but steady, decline. On the other hand, technical improvements to energy efficiency have been less over the last few years than during normal times; the reason is that recession is accompanied by less than normal investment in new capital stock such as fuel-efficient automobiles, new homes, and more efficient factories.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 15322, 15362, 16159, 16159

16168 **(DOE/FE—0081) Cooperative R and D ventures: An opportunity for leveraged research in fossil energy.** (USDOE Assistant Secretary for Fossil Energy, Washington, DC). 3 Dec 1986. 57p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005593.

Purpose of this meeting is to look beyond the status quo, to look past the conventional forms of federal R and D support, and to fashion a creative new approach to combining the talents and resources of government and industry. (DLC)

16169 **(Juel-Spez—291, pp 28-41) Fossil fuels - reserves, consumption and environment.** Rodenhaeuser, F.; Schulz, W. (Kloeckner-Humboldt-Deutz A.G., Koeln, Germany, F.R.; Bochum Univ., Germany, F.R. Lehrstuhl fuer Energieanlagentechnik). Jan 1985. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87751334.

Sozialvertraeglichkeit von Energieversorgungssystemen.

In Energy in focus. An intermediate balance of the energy debate.

The paper abstracted discusses world energy resources and reserves, the future availability of fossil fuels, conceivable trends of fossil fuel consumption and international coal, petroleum and natural gas reserves. Apart from these global aspects of fossil energy sources the paper deals with energy flow sheets and balances, the development and structure of primary energy consumption, the dependence on primary energy imports and the development of industrial emissions in the Federal Republic of Germany.

16170 **(Juel-Spez—352) World computer model of oil markets: OPEC pricing strategy model in the short and the long run.** Giesecke Sara-Lafosse, C.R. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Programmgruppe Systemforschung und Technologische Entwicklung). Mar 1986. 466p. NTIS (US Sales Only), PC A20/MF A01. File Number DE87751297.

The main objective of this thesis is to present, explain and demonstrate the three principles of energy economics. The first principle states that the marginal costs of all primary energy sources and energy products are uniquely interrelated to each other. This relation is built on technical transformation possibilities and consumer's substitution (product market competition). The second principle affirms the existence of a marginal source, whose price goes into the unidimensional energy system setting all other energy prices. At present, the model of the leading firm theory is the best approximation of actual market conditions. The price leader is Saudi Arabia and its crude oil is taken to be the marginal energy source. The model is scrutinized for stability and change. Important factors are the non-Saudi Arabian energy producers and the world oil demand price elasticity. The value of the world oil demand price elasticity is a multidimensional function of secondary energy price elasticities. Because this numerical value is important, an experiment with the model trying to fit (first order) these different product elasticities was done. The third principle asserts, that there exists a price for the marginal crude that minimizes the long term cost to the consumer and maximizes the long term wealth to the producer. The energy system elements are highly interactive, therefore the complex World Energy Model becomes necessary in selecting the best new energy alternative. To this end, natural gas transformed to methanol was chosen as a study case and the energy model expanded to test its advantages. The thesis ends with the results of this experiment and general conclusions.

2960 Electric Power

REFER ALSO TO CITATION(S) 15649, 15719, 15720, 15723, 15724, 15730, 15840, 15914, 15915, 15916, 15920, 17590, 17591, 17592

16171 **(CONF-8609236—1) Economic challenges facing rural electric cooperatives.** Costello, K.W.; Hemphill, R.C. (Argonne National Lab., IL (USA)). Aug 1986. Contract W-31109-ENG-38. 42p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005217.

From Georgia public utilities conference; Atlanta, GA, USA (10 Sep 1986).

This paper addresses some of the major rate-making issues and economic problems facing rural electric cooperatives (co-ops). These problems stem from the sharp rises in electricity rates that many co-ops are expected to experience over the next few years. These increases may lead to dramatic cutbacks in electricity usage by co-op members. Whether this will occur and will be severe enough to result in a "death spiral" effect is examined in this paper. Section II of this paper highlights the rate-making process of electric co-ops which are not subject to state regulation. This section outlines how rates are set, and focuses on the current rate structures of Illinois electric co-ops. Section III examines several eco-

nomic issues now confronting management of electric co-ops: Predicting revenue losses from higher rates based on the price elasticity of electricity usage; how usage "repression" from higher rates can be minimized by economically efficient rate designs; should marketing activities such as promotional pricing practices be adopted by co-ops to induce electricity sales in the short run; should co-ops subsidize energy conservation investments by members; and is a "death spiral" likely to occur.

16172 **(DOE/EIA—0226(86/10)) Electric power monthly, October 1986.** (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). 13 Jan 1987. 50p. NTIS, PC A03/MF A01 - GPO; 1; GPO Dep. File Number DE87004812.

In October 1986, nuclear-powered generation represented a record share, 18.3%, of the total electricity produced during the month. Nuclear net generation during October 1986 increased 16% over the October 1985 level to 36,214 gigawatthours, one of the highest levels ever reported for a single month. Petroleum net generation increased 31% in October 1986 over October 1985 generation to 9868 gigawatthours. The average price of petroleum was $13.59 per barrel.

16173 **(DOE/OR/21400—T286) Determining the extent, benefits, cost, and timing of utility conservation and load management programs.** Hirst, E. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005597.

Purpose of this paper is to discuss ways that an electric utility can determine the extent of the energy-conservation resource in its service territory, and how much of that resource can be realized at what cost and over what time period. It also briefly discusses regulatory practices that can promote or inhibit utility demand-side programs.

16174 **(EPRI-EL—5003-Vol.1) Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report.** Price, W.W.; Wirgau, K.A.; Murdoch, A.; Nozari, F. (General Electric Co., Schenectady, NY (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 116p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920237.

By transforming utility load-mix data for use in standard load flow and transient stability programs the LOADSYN software makes it easy for power system analysts to produce new, more-accurate load models for system simulations. Better models can better predict power system behavior and thus improvements in transmission system utilization and planning.

16175 **(NP—7750863) Annual report of the electric power industry of the Federal Republic of Germany 1985. (Summary of the quarterly reports). Power generation in publicly-owned electric utilities, the industrial independent units and the Federal Railways and overall the electric power consumption in the Federal Republic of Germany.** (Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)). 1986. 12p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750863.

For the year under report, figures are given on: Origins and consumption of electric power; power generation in public utilities; industrial plants and the Federal Railways; development of power consumption in the network of public utilities in the Federal States; net power generation and consumption in industry and development of the gross power generation in public power plants and industrial unnt in the Federal States.

16176 **Winning the rate base battle.** Steigelmann, W.H. *Transactions of the American Nuclear Society;* **53**: 366-367(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In most states, all costs associated with building new power plants and other facilities are born by the owning utility until the facility becomes useful to customers. For a nuclear plant, this means that a utility must raise several billion dollars in capital over a period of 10 to 20 years, often undergrowing pressures to cancel the project. None of the possible ways of mitigating rate shock is free of controversy, but the objective should be to do that which is most equitable and has least adverse effects. The basic options are discussed, and all but one involves phasing in over time the full economic effects of the new plant. The impacts on average electricity price of three of the seven approaches are illustrated.

16177 **Electric utility regulation - today and tomorrow.** Seligson, C.H. *Transactions of the American Nuclear Society;* **53**: 367(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Currently and for the last few years, numerous rate regulatory commissions and electric utilities have initiated investigations and proposals designed to mitigate the rate increases required as new nuclear generating facilities become operative. The so-called rate phase-in generally involves gradual rather than one-time rate increases to avoid rate shock to consumers. Additionally, some state regulatory commissions have eliminated from current rates the effects of new generating capacity which they have determined is unnecessary to meet the present load requirements of a given utility. State regulators have also determined that significant portions of the amounts spent on nuclear generating units over a period of years were imprudently directed, resulting in a disallowance from the rate base cost of the unit. The result of phase-in plans and disallowances has been not only smaller rate increases for consumers but also a measurable financial loss for the utility owners. Such losses have encouraged a distinct shift in future power planning methodologies to avoid long lead time, high capital cost generation for the future, resulting in a denial of the significance of the nuclear option. These new methodologies may well result in future shortages of adequate base-load capacity and a long standing utility concept of an obligation to serve.

16178 **Can nuclear power survive rate-of-return regulation?.** Dittmar, L.A. *Transactions of the American Nuclear Society;* **53**: 367-368(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Most commercial nuclear plants in the US, both under construction and in operation, are subject to rate-of-return regulation. Utilities that own nuclear plants cannot reasonably expect to recover all of the costs, including a fair return on investment, of constructing, operating, maintaining, and decommissioning their plants - at least not under regulation as it currently exists. The future of nuclear power in this country will in large part be determined by the financial and organizational restructuring of the electric utility industry that is certain to occur. This inevitable restructuring is likely to be accompanied by modifications to and realignment of the financial regulation of the electric utility industry. But such changes will not bode well for energy options that cannot meet the ultimate market test.

16179 **Planning for rate base treatment of large power plants.** Faruki, C.J. *Transactions of the American Nuclear Society;* **53**: 368(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper addresses two related areas of planning for inclusion in rate base of large generating stations. First, the paper discusses the range of options available as to how the plant is to go into rate base, e.g., phase-in plans. In this connection the process of generating the entire range of options that may be available is described and examined. Second, the paper examines innovative ways of using procedures (e.g., accounting proceedings, settlement procedures, cost caps, and other ideas short of a full-blown rate case) and the resources available in the ratemaking arena, to obtain, in the least painful way possible, the necessary ratemaking orders. The thesis is that there must be better alternatives to the many proceedings that have either begun as, or seem to be leading to, endless retrospective examinations of multiple questions (from load forecasting to construction management to continuation-of-construction decisions) under the label of prudence inquiries.

16180 **Concept of prudence and its impact.** Crowley, J.H.; Kaminski, R.S. *Transactions of the American Nuclear Society;* 53: 370-371(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The technical and financial regulation of the US nuclear electric industry is divided between the federal and state governments. The federal government oversees the environmental and safety aspects of the technology and is essentially unconcerned with costs. The state utility commissions address cost and are essentially unconcerned with the benefits which the safety and environmental enhancements add to the quality of life. Increasingly, the state utility commissions are relying on the concept of prudence to justify major cost disallowances for light water reactors (LWRs) entering the rate base. This situation, if it continues, will cause profound changes in the electric utility industry conducts its business. The authors believe these changes may not be in the long-term interest of both the ratepayers and the investors.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 16210, 16211, 16212, 16213, 16214

16181 **(EPRI-EM—4882-CCM) REEPS [Residual End-Use Energy Planning] code: User's guide.** (Cambridge Systematics, Inc., Berkeley, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jan 1987. 280p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920241.

Newly revised on the basis of users' experience, the REEPS (Residential End-Use Energy Planning System) code is an integrated end-use econometric model of residential energy-use patterns for long-term forecasting and demand-side analysis. The user's guide, which describes the logic and structure of the model, also shows how to prepare input files to execute the program.

16182 **(EPRI-EM—4988-Vol.1) Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report.** Andrews, L.M.; King, M.J.; Leary, N.; Perry, D.M.; Snow, C.C. (Battelle Columbus Labs., OH (USA); Synergic Resources Corp., Seattle, WA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Dec 1986. 238p. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920211.

The INDEPTH industrial planning methodology will enable utilities to forecast service area electricity demand. The system allows the user to develop energy forecasts for the whole industrial sector, to examine industries most important to the service area, and to study uses of electricity that are of interest in demand-side management programs. The econometric model in this volume forecasts energy use for the entire industrial sector using a set of simultaneous factor demand equations with an imposed structure derived from the economic theory of cost-minimizing behavior.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 15596, 15601, 15609, 15610, 15632, 15637, 15639, 15641, 15643, 15647, 15648, 15649, 15651, 15656, 15658, 15659, 15660

16183 (Juel-Spez—291, pp 42-61) **Renewable energy sources and their uses - application, potentials, economic aspects.** Heinen, K.U. (Fachhochschule Koeln, Germany, F.R. Inst. fuer Tropentechnologie). Jan 1985. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87751334.

Sozialvertraeglichkeit von Energieversorgungssystemen.

In Energy in focus. An intermediate balance of the energy debate.

The large potential of renewable energy sources would theoretically suffice to cover the energy demand of the Federal Republic of Germany. The paper abstracted gives a detailed description of solar energy conversion along with the systems required to relieve the energy market (solar collectors, solar plants, solar cells, modules, heat pumps, wind turbines, biomass conversion plants).

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

REFER ALSO TO CITATION(S) 15270, 17086

16184 **(BARC—1245) Electrode boundary layer and its influence on the power output characteristics in open-cycle Faraday MHD generators.** (Bhabha Atomic Research Centre, Bombay (India)). 1984. 32p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701245.

The boundary layers present over the electrode surface in open-cycle Faraday MHD generators have been suitably considered and their effects on the generator power output have been studied. The electrode voltage drop, an important electrical loss caused by the electrode boundary layer giving rise to plasma non-uniformities inside the MHD channel, has been accounted for in the derivation of power density expression. The finite electrode segmentation in a real Faraday MHD generator has also been considered through its effect of reducing both the electical conductivity and the Hall parameter. Following a simplified approach, the expressions for the voltage drops across the gasdynamic layer, electrical sheath and slag layer have been derived to estimate the electrode voltage drop in a finitely segmented Faraday MHD generator with and without ash in the combustion products. The computed results of electrode voltage drop and power density have been discussed. The presence of slag layer over the electrode surface is found to reduce the electrode voltage drop considerably. It is argued that the finite segmentation of electrodes and the electrode voltage drop, modifying the power output significantly, should be properly taken into account while analysing the performance of a real Faraday MHD generator. 25 refs., 6 figures.

16185 **(BARC—1291) Liquid Metal MHD Generator Systems.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 81p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87701257.

Liquid Metal MHD (LMMHD) Generator Systems are becoming increasingly important in space and terrestrial applications due to their compactness and versatility. This report gives the current status and economic viability of LMMHD generators coupled to solar collectors, fast breeder reactors, low grade heat sources and conventional high grade heat sources. The various thermodynamic cycles in the temperatures range of 100degC-2000degC have been examined. The report also discusses the present understanding of various loss mechanisms inherent in LMMHD systems and the techniques for overcoming these losses. A small mercury-air LMMHD experimental facility being set up in Plasma Physics Division along with proposals for future development of this new technology is also presented in this report. 49 refs.

16186 **(DOE/ET/15601—8) Testing and evaluation of heat recovery/seed recovery: Annual technical progress report, april 1981-March 1982.** (Mississippi State Univ., Mississippi State (USA). MHD Energy Center). Apr 1982. Contract AC02-80ET15601. 150p. Minerals Management Service, 18th and C Streets, NW, Washington, DC 20240. File Number DE87005005.

Mississippi State University has constructed a test stand that can simulate the gas-slag-seed stream composition, temperature, and metal/fireside environmental conditions for the radiant furnace, superheater, and other HRSR components of a coal-fired base-line MHD power plant. The test stand is being used to study the effects of combustion stoichiometry and secondary combustion on NO/sub x/ generation, heat transfer, and gas stream properties. Microprocessor-controlled diagnostic instruments are being evaluated by using them on the test stand to measure temperatures and characterize the gas-slag-seed stream. The facility will also be used to obtain corrosion-erosion data on off-the-shelf commercial materials, to evaluate gas stream and heat transfer models, and to perform, as directed by DOE, any tests necessary to supply data for the national MHD research effort and especially the HRSR program.

16187 **(N—87-11837) Space-based laser-driven MHD generator: feasibility study. Final report.** Choi, S.H. (Information and Control Systems, Inc., Hampton, VA (USA)). Oct 1986. 52p. (NASA-CR—178184; NAS—1.26:178184; REPT—681104). NTIS, PC A04/MF A01.

The feasibility of a laser-driven MHD generator, as a candidate receiver for a space-based laser power transmission system, was investigated. On the basis of reasonable parameters obtained in the literature, a model of the laser-driven MHD generator was developed with the assumptions of a steady, turbulent, two-dimensional flow. These assumptions were based on the continuous and steady generation of plasmas by the exposure of the continuous wave laser beam thus inducing a steady back pressure that enables the medium to flow steadily. The model considered here took the turbulent nature of plasmas into account in the two-dimensional geometry of the generator. For these conditions with the plasma parameters defining the thermal conductivity, viscosity, electrical conductivity for the plasma flow, a generator efficiency of 53.3% was calculated. If turbulent effects and nonequilibrium ionization are taken into account, the efficiency is 43.2%. The study shows that the laser-driven MHD system has potential as a laser power receiver for space applications because of its high energy conversion efficiency, high energy density and relatively simple mechanism as compared to other energy conversion cycles.

3005 Fuel Cells

16188 **(CONF-861008—2) Design and economics of large fuel cell power plants.** Minkov, V.; Daniels, E.; Dennis, C.; Krumpelt, M. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004823.

From Fuel cell seminar; Tucson, AZ, USA (26 Oct 1986).

This paper discusses two new system designs for phosphoric acid and molten carbonate fuel cells. Both designs were developed cascading the flow of energy through the fuel cells, combustion turbine and steam turbine. By varying the utilization of fuel in the fuel cells and the current density, the distribution of power among the prime movers is being changed, and effects of those changes analyzed. The general approach for evaluating and developing cost-effective fuel-cell systems is to optimize them for minimum cost of electricity (COE) through integrated thermodynamic simulation and cost analysis using the SALT code.

16189 **(CONF-861008—3) Progress on molten carbonate fuel cell alternative cathodes.** Smith, J.L.; Kucera, G.H.; Minh, N.Q. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004862.

From Fuel cell seminar; Tucson, AZ, USA (26 Oct 1986).

Li_2MnO_3 and $LiFeO_2$ have been developed to the point that they should perform well in a cell. The cathode microstructure is of critical importance in obtaining good performance with these materials whose resistances are higher than NiO. Several methods have been developed to provide the dual porosity materials for fabrication of the required cathode structure for cell testing.

16190 **(CONF-861008—4) Electronic defects in $LiFeO_2$.** Smith, J.L.; Kucera, G.H.; Minh, N.Q.; Moreschi, J.R. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004863.

From Fuel cell seminar; Tucson, AZ, USA (26 Oct 1986).

The studies on undoped $LiFeO_2$ to date have provided an understanding of the conduction mechanisms and of the effect of reaction environment on the stoichiometry of the material. The semiconductor type and its region of influence as well as the degree of cation nonstoichiometry have been assessed while that of oxygen nonstoichiometry is under way. It should be possible to obtain the defect equilibrium constants from the p_{O_2} thermogravimetric measurements and accordingly the ΔH and ΔS of the defect reaction.

16191 **(CONF-861008—5) Characterization of monolithic fuel cell components.** Dees, D.W.; Mrazek, F.C. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004929.

From Fuel cell seminar; Tucson, AZ, USA (26 Oct 1986).

Electrochemical characterization of materials and components is an important part of the monolithic fuel cell development effort. The bulk electrical/ionic conductivity of all cell materials has been determined over the range of temperatures (800 to 1000°C) and oxygen pressures (0.2 to 10^{-18} atm). A series of ac impedance studies has been performed on various three-layer (anode/electrolyte/cathode) composite samples. A complex impedance diagram for one of the composites is given. While current densities up to 2.2 A/cm² have been observed, further increases are possible through reduced interfacial resistances.

16192 **(CONF-8609230—1) High-temperature fuel cells.** Pierce, R.D. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004870.

From Electrochemical sciences conference; Cleveland, OH, USA (14 Sep 1986).

The DOE is about to embark on the development and demonstration of a prototype MCFC stack of 0.1 to 0.5 MW. This engineering effort will be complemented by base technology and component development contracts sponsored by DOE and EPRI. The tubular SOFC concept under development by Westinghouse is being tested in multikilowatt generators. Cell endurance and cost are the major issues for both concepts. ANL is developing the monolithic SOFC concept with laboratory-scale cell arrays. Continued development of advanced ceramic fabrication technology is the major thrust of that program.

16193 **(DOE/MC/12841—2254) Interaction of trace species with the molten carbonate fuel cell: Task report No. 12.** Bloomfield, D.; Gelb, A.; Guberman, S.; Lewis, P. (Physical Sciences, Inc., Woburn, MA (USA)). Nov 1979. Contract AT21-79MC12841. 61p. (TR—192). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005021.

The concept of a molten carbonate fuel cell/coal gasifier power plant is under development at the present time. Since a large number of trace species will be found in the coal gasifier effluent and further, since the effect of these trace species on molten carbonate fuel cells is not known, an estimate of this effect is required. The motivation for the study is further enhanced by the fact that the cell surface area is quite large, about 3.5×10^6 ft² in the case of the ECAS II molten carbonate fuel cell. Hence, any trace species entering the cell will have ample opportunity to react with the electrodes or the electrolyte. It is relatively simple to show (neglecting solubility effects) that if a trace species strongly adsorbs on an electrode then at a concentration of only 1 ppM, the total pore area of the electrode (about 40 sq miles in the ECAS II power plant) would be covered to 50% in about a day.

16194 **Computer-based phosphoric acid fuel cell analytical tools - Descriptions and usages.** Lu, C.; Presler, A.F. (NASA Lewis Research Center, Cleveland, OH 44135). pp 165-167 of Progress in batteries and solar cells. Cleveland, OH; JEC Press Inc. (1987).

Under DOE support, NASA Lewis Research Center (LeRC)/Cleveland State University (CSU) have developed simulation models which predict the phosphoric acid fuel cell (PAFC) power plant system performance under steady and transient states, and design the configuration of components and the synthesis of systems optimally. Two computer models are developed: an engineering model and a system model. The engineering, or "multi-staged," model which is solved by the finite difference method, determines the balances and properties at different sections. A mainframe computer (e.g., IBM 370/3033) is needed to solve this model. The system, or "single-staged," model uses the thermodynamic balances to set up algebraic equations and calculates the physical and chemical properties of the streams for one operating condition, such as the mean temperature and pressure. The personal computer spreadsheet program, Lotus 1-2-3, is used to develop the system

model. Spreadsheet-created process simulation offers a convenient, flexible means of modeling chemical processes and comparing their yields and costs. The authors have developed four areas of application for these models. For the engineering model: 1. To simulate the performance of the designed system in the steady and transient states (i.e., load changing period). 2. To optimize the component configurations and operating conditions.

16195 **Catalyst and electrode research for phosphoric acid fuel cells.** Antoine, A.C.; King, R.B. (NASA Lewis Research Center, Cleveland, OH 44135). pp 168 of Progress in batteries and solar cells. Cleveland, OH; JEC Press Inc. (1987).

The US Department of Energy (DOE) is funding phosphoric acid fuel cell commercialization programs at Westinghouse, Engelhard, and UTC. In support of these commercialization efforts, DOE Morgantown Energy & Technology Center, Morgantown, WV, is also funding research under an advanced research and technology development (AR & TD) program. These programs are managed by NASA Lewis Research Center, Cleveland, OH, and include, in addition to catalyst and electrode research, carbon component technology development at Great Lakes Research Corp. and fuel cell modelling and analysis support work at Cleveland State University. The major purpose of the AR & TD program is to conduct research on fuel cell catalysts and electrodes, the results of which will provide major improvements in electrode performance and life, and also will aid in reducing fuel cell costs.

16196 **Investigation of alternative MCFC cathode materials at Argonne National Laboratory.** Pierce, R.D.; Smith, J.L.; Kucera, G.H. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). pp 159-164 of Progress in batteries and solar cells. Cleveland, OH; JEC Press Inc. (1987). Contract W-31-109-ENG-38.

The conventional cathode material for a molten carbonate fuel cell (MCFC) is NiO. However, these cathodes have limited longevity due to dissolution at cathode conditions and precipitation as metal at anode conditions. Alternative cathode materials are being sought through a process of identifying stable materials in the cathode environment, evaluating their properties, and modifying their conductivity through doping. The work has centered on LiFeO/sub 2/ and Li/sub 2/MnO/sub 3/ which are stable, have low solubility, and do not migrate under cell conditions. LiFeO/sub 2/ can be produced with resistivity in the range of 10-40 ohm-cm at 650°C in realistic cathode gases.

16197 **Materials for high-temperature fuel cells.** Ackerman, J.P.; Claar, T.D. (Argonne National Lab., Argonne, IL 60439). pp 137-143 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

High-temperature fuel cells offer numerous opportunities for implementation of advanced materials and processing technologies. The functional requirements of cell materials and components have been reviewed and the potential applicability of several emerging fields of materials research and development relevant to fuel cells have been discussed. Continued interaction between fuel cell technologists and materials researchers in the future offers exciting possibilities for the development of fuel cells with improved capabilities.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 16160

16198 **Long-term energy projections and novel energy systems.** Rogner, H.H. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Energy demand and supply projections are bound inextricably with external realities. Consequently, they reflect the dominant views on the development of those factors that primarily determine energy consumption. Some of these factors are highly uncertain or so difficult to quantify that it is impossible to model their effects. Other factors, such as economic activity or population development, can serve as variables that, to a large extent, determine energy consumption. Hence, parallel to the prospect of global economic activity slowly shifting from exponential growth (until the 1970s considered the norm) to a prolonged period of low growth, there have been similar downward revisions in the corresponding energy consumption. But, there are other reasons for the recent downward revisions of energy projections. In contrast to energy forecasters of the 1970s, today's analyst can base their projections on empirical evidence about the response of industries and households to two unprecedented oil price increases of the last decade. Adjustments to the realities of high energy costs have resulted in energy efficiency improvements along the entire energy chain from resource extraction to consumption, as well as interfuel substitution, structural economic changes, and changes in individual attitudes.

3201 Buildings

REFER ALSO TO CITATION(S) 16165, 16181

16199 **(BRE-IP—14/86) Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre.** McCall, M.J. (Building Research Establishment, Watford (UK)). Nov 1986. 4p. Publications Sales Office, Building Research Establishment, Garston, Watford WD2 7JR.

A 12 month monitoring period has demonstrated that the performance of a gas engine driven dehumidification system for an indoor swimming pool at the Farnborough Recreation Centre has exceeded design expectations and achieved a 70% saving in heating energy. Assessment of the installation's operation has revealed that future gas engine heat pump systems could provide even greater savings by use of fresh air ventilation.

16200 **(CONF-861204—4) Measurements of pressure drop in turbulent pipe flows of highly loaded HDPE slurries.** Choi, U.S.; Kasza, K.E. (Argonne National Lab., IL (USA)). Nov 1986. Contract W-31109-ENG-38. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004833.

From 4. Miami international symposium on multi-phase transport and particulate phenomena; Miami Beach, FL, USA (15 Dec 1986).

Argonne National Laboratory, under sponsorship of the US Department of Energy, is developing advanced energy transmission fluids for improving thermal system performance. The efforts are based on two concepts: (1) utilization of very low concentrations (20 to 200 wppM) of non-Newtonian additives to the appropriate carrier liquid to reduce frictional flow losses by 30 to 80%; and (2) utilization of a pumpable phase change slurry comprised of particulates of a high heat of fusion material conveyed by a liquid to enhance both bulk convective energy transport and heat transfer coefficients at heat exchanger surfaces. One example of candidate particles is cross-linked form-stable high density polyethylene (X-HDPE).

16201 **(DOE/CE/10156—1) ICP [Institutional Conservation Program] monitoring: Final report.** (Arawak Consulting Corp., New York (USA)). Sep 1986. Contract AC02-83CH10156. 70p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87004910.

The following pages present the Final Report of activities undertaken by Arawak in carrying out its contractual obligations for the New York Support Office of US Department of Energy. The contract calls for the field monitoring/review of DOE grants to schools and hospitals under the Institutional Conservation Program (ICP). This Final Report is the result of a review of statistics and findings gathered over the period of the contract, which included monitoring visits to 78 grantees in New York State and New Jersey. The report is intended to highlight aspects of the monitoring project and to make recommendations.

16202 (Juel-Spez—291, pp 115-129) **Heating systems.** Schulz, W.; Rodenhaeuser, F. (Bochum Univ., Germany, F.R. Lehrstuhl fuer Energieanlagentechnik; Kloeckner-Humboldt-Deutz A.G., Koeln, Germany, F.R.). Jan 1985. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87751334.

Sozialvertraeglichkeit von Energieversorgungssystemen.

In Energy in focus. An intermediate balance of the energy debate.

Energy consumption due to space heating is of particular interest. Apart from private households it also includes industry and the small consumers. The heat market absorbs almost 3/4 of end use energy demands. There is a particular demand for space heating. Private household energy consumption is classified by energy sources and heating systems. Space heating is making use of heating oils, natural gas, coal, electric power and district heat. Heating systems may consist in furnaces, central heating systems, district heating systems or heat pumps and solar systems. The development of heating structures is classified by energy sources and individual or central heating systems.

16203 **(LBL—21862) Ventilation and occupant behavior in two apartment buildings.** Diamond, R.C.; Modera, M.P.; Feustel, H.E. (Lawrence Berkeley Lab., CA (USA)). Oct 1986. Contract AC03-76SF00098. 23p. (CONF-8609226—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003550.

From 7. Air Infiltration Centre conference, occupant interaction with ventilation systems; Stratford-upon-Avon, UK (29 Sep 1986).

In this paper we approach the subject of ventilation and occupant behavior in multifamily buildings by asking three questions: (1) why and how do occupants interact with ventilation in an apartment building, (2) how does the physical environment (i.e., building characteristics and climate) affect the ventilation in an apartment, and (3) what methods can be used to answer the first two questions. To investigate these and related questions, two apartment buildings in Chicago were monitored during the 1985-1986 heating season. In addition to collecting data on energy consumption, outdoor temperature, wind speed, and indoor apartment temperatures, we conducted diagnostic measurements and occupant surveys in both buildings. The diagnostic tests measured leakage areas of the individual apartments, both through the exterior envelope and to other apartments. The measured leakage areas are used in conjunction with a multizone air flow model to simulate infiltration and internal air flows under different weather conditions. The occupants were questioned about their attitudes and behavior regarding the comfort, air quality, ventilation, and energy use of their apartments. This paper describes each of the research methods utilized, the results of these efforts, and conclusions that can be drawn about ventilation-occupant interactions in these apartment buildings. We found that there was minimal window opening during the winter, widespread use of auxiliary heating to control thermal comfort, and that the simulations show little outside air entry in the top-floor apartments during periods of low wind speeds. The major conclusion of this work is that a multi-disciplinary approach is required to understand or predict occupant-ventilation interactions. Such an approach must take into account the physical characteristics of the building and the climate, as well as the preferences and available options of the occupants.

16204 **(NP—7770052) Selection of working fluids for absorption heat pumps.** Niesemeyer, N. (Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik). 24 May 1985. 127p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE87770052.

The general acceptance of the absorption heat pump has been hampered so far by the fact that only ammonia/water and water/lithium bromide were used as working fluids. Systematic research into suitable pairs of working fluids has become possible with new techniques for analyzing the thermodynamics of mixtures. Requirements on refrigerants, absorption agents and mixtures are listed. Information is presented on how to select suitable working fluids and on the principle of correspondence for calculating the absorption process. The method of calculation is applied to ammonia/water, methylamine/water, halogenated refrigerants, saturated hydrocarbons (propane to tetradecane), and salt solutions. (HWJ).

16205 **(ORNL/TM—10264/V1) Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography.** Brown, M.A. (ed.). (Oak Ridge National Lab., TN (USA); American Inst. of Architects, Washington, DC). Nov 1986. Contract AC05-84OR21400. 86p. NTIS, PC A05/MF A01. File Number DE87005291.

This report documents the forms and procedures developed for a post-occupancy evaluation of office lighting environments. It is the first in a series of four reports. The central aim of the larger project is to explore possible causal factors that are associated with successful lighting design, with particular interest in the relationship between the connected lighting power load and subjective measures of lighting quality. A post-occupancy evaluation procedure was used as the strategy for obtaining the desired data. The procedure involved collecting several different types of data: (1) direct measures of the physical environment, including spatial luminances, illuminances and contrast conditions; (2) indirect measures such as the amount of space provided for each work station and the connected lighting power load; (3) occupant responses to lighting and other factors of the work station; and (4) a limited number of expert ratings of the lighting conditions. Data from thirteen buildings and 1217 work stations were collected. These data were built into a database allowing lighting quality to be quantified and explained.

16206 **(PB—87-108759/XAB) Development of advanced water-to-water heat pumps in the range of 200- to 5000-kW thermal output: prestudy.** Gilli, P.V. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1986. 172p. (D—17:1986). NTIS, PC PC E07/MF E01.

The feasibility study identified a program of work with the aim of developing heat pumps with a seasonal-performance factor around 4 when working from a heat-storage source of a temperature between 10 and 20 C.

16207 **Determination of household energy using 'fingerprints' from energy billing data.** Hirst, E.; Goeltz, R.; White, D. (Oak Ridge National Lab., TN, USA). *International Journal of Energy Research;* **10**: No. 4, 393-405(Oct-Dec 1986).

Electric and gas utilities (in the U.S.A.) bill their customers on a regular basis. These data provide a truly valuable information resource for energy conservation programme analysts and evaluators. This paper discusses ways to analyse such billing data. The Princeton University score-keeping model, which permits decomposition of total household energy use into its weather- and non-weather-sensitive elements is used. The score-keeping model also allows one to compute weather-adjusted energy consumption for each household based on its billing data and model parameters; this is the model's estimate of annual consumption under long-run weather conditions. The methods discussed here extend the score-keeping results to identify additional characteristics of household energy use. The methods classify households in terms of the intensity with which the particular fuel is used for space heating. In addition, households that use the particular fuel for air conditioning are identified. In essence, the billing data and model results define household energy use 'fingerprints'.

3202 Transportation

REFER ALSO TO CITATION(S) 16229, 16230, 16231, 16232

16208 **(ESC-WR—86-16) Calculation of emission scenarios for passenger cars in the Netherlands.** Kroon, P.; Scheele, D. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). Aug 1986. 16p. (In Dutch). Energie Studie Centrum ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

The Energy Study Centre of the Netherlands Energy Research Foundation ECN has developed recently an energy model which has been used for calculating emissions from passenger cars for the years 1985, 1990, 1995 and 2000. Emission components are:

sulfur dioxide, nitrogen oxides, hydrocarbons (C/sub x/H/sub y/), carbon monoxide, aldehydes, particulates and lead. The linear programming energy model optimizes costs and is described extensively in report ESC-35 which will be published soon. Nine scenario calculations have been conducted with assumed growth of the fleet of cars with 20%, 30%, 40% and 50%, and increasing mileage per year per car: 0%, 0.9%, 1.8% and 2.5%, respectively; both assumptions for the period 1983-2000. Results are presented. The study was sponsored by the Dutch Ministry of Economic Affairs. 9 tabs., 2 refs.

16209 **(ORAU/IEA—86-2(M)) Roles for electricity in transportation.** Burwell, C.C. (Oak Ridge Associated Universities, Inc., TN (USA)). Apr 1986. Contract AC05-76OR00033. 46p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004874.

Electricity plays a more important role in the provision of transportation services than is popularly thought, since electricity is used for such transportation services as pumping water. There are also many ways electricity, electric technology, and electric products make some transportation services unnecessary by decentralizing production, concentrating materials before shipment, reducing weight of transportation equipment and containers, and eliminating the transporting of fuel. This report briefly summarizes the historic and contemporary contributions of electricity in providing transportation services directly and indirectly and identifies expanded roles for electricity should they be needed or be preferred in the future.

16210 **(PB—87-112074/XAB) National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983.** Lyons, W.M. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Dec 1984. 628p. (DOT-TSC-UMTA—84-37). NTIS, PC A99/MF A01.

The report summarizes the financial and operating data submitted annually to the Urban Mass Transportation Administration by the nation's public-transit operators. It contains aggregate industry statistics and detailed financial and operating data on the individual transit systems.

16211 **(PB—87-112082/XAB) National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report.** Jacobs, M. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). May 1983. 367p. (DOT-TSC-UMTA—82-47). NTIS, PC A16/MF A01.

The report summarizes the financial and operating data submitted annually to the Urban Mass Transportation Administration by the nation's public-transit operators. It contains industry aggregate statistics and detailed financial and operating data on individual transit agencies.

16212 **(PB—87-112090/XAB) National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement.** Jacobs, M.; O'Connor, R.; Chen, S. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Jul 1983. 40p. (DOT-TSC-UMTA—83-30). NTIS, PC A03/MF A01.

This Supplement contains the transit operating statistics used in computing the FY 1981 Section 9A apportionments. These statistics are derived from the 1981 Section 15 Annual Report, and from supplemental 1981 Section 15 reports submitted by certain transit systems.

16213 **(PB—87-112108/XAB) National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980.** Morin, S.J. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Jul 1982. 391p. (DOT-TSC-UMTA—82-15). NTIS, PC A17/MF A01.

The report summarizes the financial and operating data submitted annually to the Urban Mass Transportation Administration by the nation's public-transit operators. It contains industry aggregate statistics and detailed financial and operating data on individual transit agencies.

16214 **(PB—87-112116/XAB) National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982.** Jacobs, M.; O'Connor, R.; Chen, S. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Nov 1983. 348p. (DOT-TSC-UMTA—83-46). NTIS, PC A15/MF A01.

The report summarizes the financial and operating data submitted annually to the Urban Mass Transportation Administration by the nation's public-transit operators. It contains aggregate industry statistics as well as detailed financial and operating data on the individual transit systems.

16215 **Energy savings in transportation: An overview.** Chesnes, A.A. (US Dept. of Energy, Washington, DC). pp 285-289 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Current energy use in the transportation sector is reviewed. U.S. Department of Energy supported engine development programs which integrate new and advanced materials as essential components and which should have a major positive impact on energy consumption in the transportation sector are reviewed.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 15386, 15670, 16239, 16776

16216 (CONF-8503273—Summ., pp 11, Paper 1) **Short-distance heat supply - introduction.** Hein, K. 1985. (In German). NTIS (US Sales Only), MF A01. File Number DE87751305.

From ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning; Frankfurt am Main, F.R. Germany (22 Mar 1985).

This article centers on deliberations relating to the chances and possibilities of decentralized dual-purpose-power-plants in contrast to the classical big power plants. In detail, the article deals with the fundamentals, short-distance heat supply, energy converters, fuel consumption, energy transport, and the real degree of efficiency. (HAG).

16217 **(DOE/OR/00033—T259) The role of electricity in glass making.** Burwell, C.C. (Oak Ridge Associated Universities, Inc., TN (USA)). Dec 1985. Contract AC05-76OR00033. 16p. NTIS, PC A02/MF A01. File Number DE87004885.

The electric route to glassmaking offers substantial environmental and cost benefits and a means to substitute US sources of coal and uranium for declining reserves of oil and gas. The use of electricity as a source of heat in glassmaking is competitive in cost of capital for expansion of production and in terms of energy costs, especially following deregulation of the price of natural gas. Between 1962 and 1980 the amount of total energy used per unit of glass product declined by 23% while the use of electricity (per unit of product) increased by 60%. The energy saved in using electricity for glass melting is equal to or greater than the energy needed to produce the electricity. Other benefits of electric heat include improved working conditions and improved efficiency.

16218 **(DOE/OR/00033—T263) Electricity and the pulp and paper industry.** Burwell, C.C. (Oak Ridge Associated Universities, Inc., TN (USA)). May 1985. Contract AC05-76OR00033. 27p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87004891.

The production of pulp and paper is one of North America's largest industrial activities. Paper and paperboard consumption averages almost one ton a year for each household. Many of the evolutionary changes occurring in the pulp and paper industry are based on electric technology and thus require increasing amounts of electricity. In response to the need to conserve natural resources, to minimize environmental impacts, and to control escalating energy costs, the pulp and paper industry is undergoing significant changes. On the other hand, self-generation of electricity by the pulp and paper industry has not increased since the mid-1970s despite both the prior history of increases and the increasing use of wood-derived fuels.

16219 **(DOE/OR/00033—T268) Roles of electricity: Pulp and papermaking.** Burwell, C.C.; Mills, M. (ed.); McCarthy, D. (ed.). (Oak Ridge Associated Universities, Inc., TN (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Sep 1986. Contract AC05-76OR00033. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004886.

The report begins with a brief description of the industry. The pulp and paper business, while seemingly homogeneous, is enormously variable in detail. In this brief analysis, the reader is provided with an overview of the subject - a view of the forest, so to speak, not of the trees - sufficient to grasp the forces causing change in the industry. It will be seen that these changes, in general, are dictating an increasing dependence on electricity. The focus of this analysis has been to shed light on the increasing role for electricity in the age-old process of papermaking.

16220 **(DOE/OR/00033—T269) Roles of electricity: Electric steelmaking.** Burwell, C.C. (Oak Ridge Associated Universities, Inc., TN (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Jul 1986. Contract AC05-76OR00033. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004888.

Electric steel production from scrap metal continues to grow both in total quantity and in market share. The economics of electric-steel production in general, and of electric minimills in particular, seem clearly established. The trend towards electric steelmaking provides significant economic and competitive advantages for producers and important overall economic, environmental, and energy advantages for the United States at large. Conversion to electric steelmaking offers up to a 4-to-1 advantage in terms of the overall energy used to produce a ton of steel, and s similar savings in energy cost for the producer. The amount of old scrap used to produce a ton of steel has doubled since 1967 because of the use of electric furnaces.

16221 **(PB—87-111738/XAB) Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report.** Sims, R.C.; Sims, J.L.; Sorensen, D.L.; Hastings, L.L.; Doucette, W.J. (Utah State Univ., Logan (USA). Utah Water Research Lab.). Oct 1986. 170p. NTIS, PC A08/MF A01.

The two-volume report presents information pertaining to quantitative evaluation of the soil-treatment potential resulting from waste-soil interaction studies for four specific wastes-listed under Section 3001 of the Resource Conservation and Recovery Act (RCRA). Volume 1 contains information from literature assessment, waste-soil characterization, and treatability screening studies for each selected waste. The scope of the study involved assessment of the potential for treatment of these hazardous wastes using soil as the treatment medium.

16222 **(PB—87-111746/XAB) Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report.** Sims, R.C.; Sorensen, D.L.; Doucette, W.J.; Hastings, L.L.; Sims, J.L. (Utah State Univ., Logan (USA). Utah Water Research Lab.). Oct 1986. 255p. NTIS, PC A12/MF A01.

The two-volume report presents information pertaining to quantitative evaluation of the soil-treatment potential resulting from waste-soil interaction studies for four specific wastes listed under Section 3001 of the Resource Conservation and Recovery Act. Volume 2 contains results from bench-scale waste-soil interaction studies; degradation, transformation, and immobilization data are presented for four specific wastes: API separator sludge, slop oil emulsion solids, pentachlorophenol wood preserving waste, and creosote wood-preserving waste. The scope of the study involved assessment of the potential for treatment of these hazardous wastes using soil as the treatment medium.

16223 **Energy savings in the industrial sector - An overview.** Streb, A.J. (US Dept. of Energy, Washington, DC). pp 391-395 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

The purpose of this presentation is to give the audience an overview of the industrial sector's present and projected energy consumption, the potential for energy savings in the sector's most energy-intensive industries, and areas of advanced technology that can produce significant energy savings in the future with special emphasis on the contributions which will be made by materials technologies.

16224 **Pulp and paper industry energy impacts through implementation of biotechnologies.** Griffin, E.A. pp 211-214 of Proceedings of the 1984 research and development conference. Atlanta, GA; Tappi Press (1984). (CONF-8409153—).

From TAPPI research and development conference; Appleton, WI, USA (30 Sep 1984).

Innovative biodegradation techniques have been developed to handle organic wastes from both the chemical and pulp and paper industries. These innovative methods used some type of aerobic microbial degradation to reduce biological oxygen demand (BOD), chemical oxygen demand, (COD), and total dissolved solids. Some of the techniques studied are: series lagoons, high-volume activated sludge, pure oxygen aeration, and deep-shaft aeration. Deep-shaft aeration, which uses pressure to increase oxygen transfer during biodegradation of wastes, requires the least energy per kg of BOD removed. Energy requirements for the four methods are presented.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 15595, 15669, 15670, 15671, 15672, 15673, 15674, 15675, 15676, 15677, 15678, 16216, 16488, 16489, 16498, 16715, 16774

16225 **(CONF-8412124—Exc.) Is waste incineration feasible. Result of experts' discussion on a waste management concept for the south western and southern Palatinate. 2. Ed. .** (Ministerium fuer Umwelt und Gesundheit des Landes Rheinland-Pfalz, Mainz (Germany, F.R.)). Jun 1986. 49p. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

The booklet contains 5 different speeches of the colloquium on waste management. The topics include ecological waste product utilization, various technological methods, requirements refuse-fueled heating power stations have to fulfill, and alternative ways of waste product utilization.

16226 (CONF-8412124—Exc., pp 51-55) **Waste management concept for the south western and southern Palatinate.** Toepfer, K. Jun 1986. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

Abfallwirtschaft in Rheinland-Pfalz. No. 3.

In addition to the reduction or avoidance of waste products, the political concept of the government of Rhineland-Palatinate

contains following alternatives: composting; recycling of materials; energy recovery by incineration; sorting of waste products; storing.

16227 **(PB—87-109179/XAB) Simulation of heat losses and ground temperatures for district-heating culverts. Comparison with field experiments for well-insulated, damaged, and extra-insulated culverts.** Hagentoft, C.E. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1986. 74p. (D—16:1986). NTIS, PC PC E04/MF E01.

Many old district-heating culverts are in bad condition due to the entry of water into the thermal insulation. The thermal conductivity, and thereby the heat loss from the culvert, is much larger for a wet than a dry thermal insulation. The high energy prices make it interesting and necessary to find the water-damaged parts of the district-heating culvert and improve the thermal insulation so that a reduction in the heat losses is obtained. The aim of the project is to develop a simple field method to determine the heat loss and the condition of the culvert. The method is based on the measurement of the temperature on the top of the culvert and a classification of the soil. The classification of the soil gives an estimation of its thermal conductivity. The heat loss and the reduction in heat loss due to an extra insulation is estimated from these data. Five different types of culverts were tested: two types of asbestos cement culverts, one concrete culvert, and two aerated concrete culverts. The comparison of the measured temperatures and the temperatures obtained from the simulations is reported in the study.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

16228 **(N—87-11790) Compound cycle engine program.** Bobula, G.A.; Wintucky, W.T.; Castor, J.G. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 23p. (NASA-TM—88879; E—3286; NAS—1.26:88879; USAAVSCOM-TR—86-C-37; CONF-861128—1). NTIS, PC A02/MF A01.

From 10. scientific meeting of the Society for Reactor Safety; Cologne, F.R. Germany (12 Nov 1986).

The Compound Cycle Engine (CCE) is a highly turbocharged, power compounded power plant which combines the lightweight pressure rise capability of a gas turbine with the high efficiency of a diesel. When optimized for a rotorcraft, the CCE will reduce fuel burned for a typical 2 hr (plus 30 min reserve) mission by 30 to 40 percent when compared to a conventional advanced technology gas turbine. The CCE can provide a 50 percent increase in range-payload product on this mission. A program to establish the technology base for a Compound Cycle Engine is presented. The goal of this program is to research and develop those technologies which are barriers to demonstrating a multicylinder diesel core in the early 1990's. The major activity underway is a three-phased contract with the Garrett Turbine Engine Company to perform: (1) a light helicopter feasibility study, (2) component technology development, and (3) lubricant and material research and development. Other related activities are also presented.

16229 **(PB—87-112512/XAB) Technology and market assessment of gas-fueled vehicles in New York State.** (Mueller Associates, Inc., Baltimore, MD (USA)). Aug 1983. 654p. NTIS, PC PC E99.

16230 **(PB—87-112520/XAB) Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report.** (Mueller Associates, Inc., Baltimore, MD (USA)). Aug 1983. 81p. NTIS, PC A05/MF A01.

Also available in set of 3 reports PC E99, PB87-112512.

The three-volume report details an investigation into the technical and economic feasibility and market potential of gaseous-fuel use in New York State highway fleet vehicles. The conversion of gasoline-fueled vehicles to the alternative fuels - compressed natural gas, liquefied natural gas, propane and liquefied petroleum gases - was assessed based on various issues and problems: the state of the art of gas-fueled vehicles and refueling equipment; the economics of conversion; current research activities; future specific research and development needs; and public actions that could further conversion in the state. Benefits of conversion include reduced dependence on gasoline and diesel fuel, reduced air pollution, and development of indigenous New York State sources of these alternative fuels.

16231 **(PB—87-112538/XAB) Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report.** (Mueller Associates, Inc., Baltimore, MD (USA)). Aug 1983. 332p. NTIS, PC A15/MF A01.

Also available in set of 3 reports PC E99, PB87-112512.

The contents of Volume II deal primarily with the technology and economics of vehicle conversion, refueling equipment design, etc. for using gaseous fuels in transportation vehicles. Other issues explored include safety considerations, vehicle exhaust emissions when using gaseous fuels, sensitivity analyses of the economic parameters of fleet-vehicle conversions, identification of the best fleets for conversion, new developments in gaseous-fuel storage and compressor design plus research and development needs.

16232 **(PB—87-112546/XAB) Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report.** (Mueller Associates, Inc., Baltimore, MD (USA)). Aug 1983. 241p. NTIS, PC A11/MF A01.

Also available in set of 3 reports PC E99, PB87-112512.

The contents of Volume III deal primarily with the institutional barriers and market forces affecting the potential conversion of vehicles in New York State (NYS) to gaseous fuels. The results of a market-research survey are presented along with the current supply conditions for fuels in NYS. The indigenous resources of gaseous fuels in NYS are identified and quantified. The potential number of vehicles in NYS that are favorable candidates for conversion are estimated, and the effect of these potential gaseous-fueled vehicles on NYS gaseous fuels supplies is presented.

3302 External Combustion Engines

REFER ALSO TO CITATION(S) 15673

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 16209

16233 **(PB—87-113338/XAB) Battery-powered vehicle research in South Africa.** Anderson, R.B.; van Niekerk, H.R. (Council for Scientific and Industrial Research, Pretoria (South Africa). National Electrical Engineering Research Inst.). 1982. 18p. NTIS, PC PC E04/MF E04.

North American Continent sales only.

The systems described comprise, an automatic microprocessor control of a gearbox drive system, the development of an optimized disc motor design, a partial hydrostatic/electric-drive system, a novel 9-phase ac drive, developments in control and power-switching technology for both ac and dc drives, and machine design criteria for electric motors having power electronic controllers.

3304 Hybrid Systems

16234 **(CONF-8610122—12) Batteries for hybrid vehicles or other high-power applications.** Miller, J.F.; Lee, J.; Christianson, C.C. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02. File Number DE87004928.

From 8. international electric vehicle symposium ↑; 0.

Argonne National Laboratory conducted a study to identify promising battery designs for application in future hybrid vehicles (HVs). A preliminary set of battery requirements for HVs was established using information available from previous studies and also by contacting potential HV developers worldwide. The consensus

of the information obtained indicated that, as compared with the electric vehicle battery, the HV battery will be smaller and lighter, must have higher power capability per unit weight and will, on the average, be discharged at higher rates. Based upon the preliminary battery requirements, many different battery technologies proposed for the hybrid-vehicle mission were evaluated. Although no existing battery presently developed satisfies all of the preliminary requirements, the analysis has shown that several battery types, with appropriate redesign and development, are good candidates for meeting the hybrid-vehicle application requirements.

3307 Emission Control

16235 **(NP—7770061) Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town.** Plecher, K. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Medizinische Fakultaet). 10 Jan 1983. 60p. (In German). NTIS (US Sales Only), MF A01. File Number DE87770061.

To determine the pollution load caused for a small town by automobile traffic, this work, contrary to tests conducted normally on particulates, determined the concentrations of lead, zinc, iron and 3,4-benzopyrene, as specific parameters of automobile traffic, in the road dust of Herzogenaurach (inhabitants in 1980: approximately 17,000). The results clearly show the different levels of traffic-related pollution in different parts of the town. In residential areas the particulates samples investigated carried only about one half to one third of the pollutants Pb, Zn, Fe, benzopyrene as compared to those from the centre of the town (here: 0.87 mg lead/g particulates and 0.75 mg zinc/g particulates). As compared with the nearby city of Erlangen, pollution levels are three to four times lower. Between the different compounds, there exist in part close relationships. Especially for the relations of heavy metals to each other, but also of lead to 3,4-benzopyrene, almost always high correlation coefficients of r=+0.6 to r=+0.9 are calculated. The results show the analysis of samples of road particulates for automobile-specific pollutants to be a practicable method by which traffic-related immission loads also for large areas can be evaluated at long term. It is a method requiring little material and involving reasonable amounts of time, and one permitting a great evaluation density.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 15333

35 Arms Control

REFER ALSO TO CITATION(S) 16683

36 MATERIALS

REFER ALSO TO CITATION(S) 15737

16236 **(SAND—86-2759) Residual effects in laminated, curved, composite panels.** Reuter, R.C. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Jan 1987. Contract AC04-76DP00789. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005624.

Analytical techniques were employed to characterize residual effects induced in laminated, curved, composite panels during fabrication processing. The residual effects include circumferential residual stresses which develop while the laminated panel is in place over its mold, and a change in panel curvature which occurs following release of the panel from the mold and relief of the residual stresses. The analysis was utilized to predict the radium of a mold upon which panels could be fabricated so that they deform, upon release from the mold, to a predetermined radius of curvature. Sample panels were fabricated which provided experimental data and particle verification of the analytical methods developed.

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 15272, 15290, 15486, 15679, 15694, 15695, 15736, 15763, 15764, 15764, 15765, 15765, 15766, 15766, 15768, 15769, 15797, 15855, 15866, 15866, 15868, 15948, 16029, 17521, 17551, 17573, 17576, 17576, 17583, 17583

16237 **(ANL/EES-TM—319) Radioactive waste isolation in salt: Peer review of the Office of Nuclear Waste Isolation's draft report on a multifactor test design to investigate uniform corrosion of low-carbon steel.** Paddock, R.A.; Lerman, A.; Ditmars, J.D.; Macdonald, D.D.; Peerenboom, J.P.; Was, G.S.; Harrison, W. (Argonne National Lab., IL (USA)). Jan 1987. Contract W-31109-ENG-38. 85p. NTIS, PC E04/MF A01; GPO Dep. File Number DE87005645.

Includes 1 sheet of 48x reduction microfiche.

This report documents Argonne National Laboratory's review of an internal technical memorandum prepared by Battelle Memorial Institute's Office of Nuclear Waste Isolation (ONWI) entitled Multifactor Test Design to Investigate Uniform Corrosion of Low-Carbon Steel in a Nuclear Waste Salt Repository Environment. The several major areas of concern identified by peer review panelists are important to the credibility of the test design proposed in the memorandum and are to adequately addressed there. These areas of concern, along with specific recommendations to improve their treatment, are discussed in detail in Sec. 2 of this report. The twenty recommendations, which were abstracted from those discussions, are presented essentially in the order in which they are introduced in Sec. 2.

16238 **(BARC—1244) Thermodynamic data of intermetallic compounds.** (Bhabha Atomic Research Centre, Bombay (India)). 1984. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701244.

The data are presented in the alphabetical order of the chemical symbol for the elements. Each table presents the data of a group of binary intermetallic compounds with a common first component. For example, Table 1 shows the data of all binaries of silver. The table lists the properties indicated. For completeness, the experimental methods used in obtaining the data are also listed in the remarks column. The units are kJ mol/sup -1/ for all energy quantities and J K/sup -1/ mol/sup -1/ for entropies. 38 tables.

16239 **(BMFT-FB-T—86-109) Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report.** Beppler, E.; Janhsen, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Dec 1986. 96p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87751300.

The aim of this work was to research the mechanism of the SiO/sub 2/ reaction with coke in pure SiO/sub 2/, SiO/sub 2/-Fe/sub 2/O/sub 3/, and SiO/sub 2/-Fe/sub 2/O/sub 3/-CaO-mixtures, ores, pellets and sinters of different basicity, as well as SiO/sub 2/-reduction from the coke ash. It was also investigated to what extent the SiO/sub 2/ reduction took place in coke removed from the blast furnace. SiO/sub 2/ reacts in stages as a function of the temperature as follows: 1.) SiO/sub 2/+2C/sub Fe/=Si/sub Fe/+2 CO; 2.) SiO/sub 2/+2C/sub Fe/(+Fe)=Fe/sub Si/+2 CO; 3.) SiO/sub 2/+3 C=SiC+2 CO; 4.) SiO/sub 2/+C=SiO+CO. The reduction of pure SiO/sub 2/ with carbon begins at 1400/sup 0/C and exhibits the strongest reaction at 1600/sup 0/C. Here, the formation of SiC and gaseous SiO overlap. The tests on SiO/sub 2/-Fe/sub 2/O/sub 3/-mixtures show that SiO/sub 2/ reduction starts only after the reduction of the Fe-oxide to C-saturated Fe has been fully completed. The reaction leading to SiC and SiO takes place here only after saturation of the Fe with Si following the Si/sub Fe/ and FeSi reactions. The reduction mechanism for the coke SiO/sub 2/ is the same. The presence of CaO encourages the partical reactions taking place at higher temperatures. In pellets, ores, and sinter, the SiO/sub 2/ reaction takes place almost exclusively by means of Si/sub Fe/ because of the high Fe-oxide level. In sinters with a higher basicity, Si/sub Fe/ is suppressed in favour of partial reactions taking place at higher temperatures. Measurements of coke removed from the tuyere level show appreciably reduced

oxide contents compared with the input coke. With 51 refs., 5 tabs., 49 figs.

16240 **(BNL—39052) Annealing of cold worked hypostoichiometric Ni_3Al alloys using positron lifetime spectroscopy.** Usmar, S.G.; Lynn, K.G. (Brookhaven National Lab., Upton, NY (USA)). 1 Dec 1986. Contract AC02-76CH00016. 5p. (CONF-861207—55). NTIS, PC A02. File Number DE87005248.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Hypostoichiometric Ni_3Al alloys of composition 76.2 Ni:23.8 Al containing impurity levels of boron and hafnium were either cold rolled or pressed. Rolled and pressed samples were deformed by 20% and 10% thickness reductions, respectively. Samples were annealed isochronally at approximately 50°C intervals up to 1050°C. Two major annealing stages were apparent in all three alloys studied. These could be attributed to vacancy migration to sinks and annealing of dislocations and(or) recrystallization. The onset of vacancy migration occurred at approximately 200°C in all three alloys. Annealing of dislocations started at 650°C to 700°C and was complete at 1000°C for alloys which contained boron and or hafnium impurities. In the pure alloy the onset of dislocation annealing occurred at 800°C and was incomplete at the highest (1050°C) annealing temperatures reached.

16241 **(BNL—39096) Modification of the properties of metal overlayers on Nb(110) and Ta(110).** Ruckman, M.W.; Strongin, M.; Pan, X. (Brookhaven National Lab., Upton, NY (USA); Queens Coll., New York (USA). Dept. of Physics). 1986. Contract AC02-76CH00016. 11p. (CONF-861207—44). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004606.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Modification of the physical and chemical properties of noble and near-noble metal monolayer films supported on Nb(110) and Ta(110) is demonstrated using photoemission and LEED. Strong adlayer-substrate bonding leads to the formation of two-dimensional coherent Pd or Pt overlayers at low coverage ($\theta < 0.7$ ML). Ni and Cu form one-dimensional coherent structures because the additional interfacial misfit cannot be overcome by substrate-overlayer bonding. In the case of Ag and Au overlayers, slightly strained pseudomorphic structures are formed because the lattice misfit is small. The strong overlayer-substrate bonding produces large changes in the chemical activity of near-noble metal overlayers. Photoemission measurements on Pt monolayers show that the hybridized metal d-states are shifted further below the Fermi level "E/sub F/" and show a reduction in the surface density of states at E/sub F/. This absence of bonding d-states near E/sub F/ effects CO chemisorption. However, as additional layers of Pd and Pt are deposited, the d-occupancy at E/sub F/ grows, with "constant" atomic structure and the amount of CO increases. Hence, in these systems chemisorption changes can be studied as a function of changing electronic structure while holding the surface structure fixed.

16242 **(BNL—52049) Hydrogen degradation of pipeline steels: Final report.** Holbrook, J.H.; Collings, E.W.; Cialone, H.J.; Drauglis, E.J. (Battelle Columbus Labs., OH (USA); Brookhaven National Lab., Upton, NY (USA)). Mar 1986. Contract AC02-76CH00016. 163p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87005585.

Purpose of investigations conducted by Battelle Columbus Laboratories was to develop a research data base applicable to the problem of hydrogen degradation in pipeline steels. The findings would provide pipeline designers and operators with insight for developing specifications and procedures in the event available natural gas transmission/distribution systems are used for hydrogen transport. Fundamental investigations and data derived from sophisticated analytical and test procedures have been equated to practical field conditions and experiences as may be encountered should the hydrogen energy storage/transport option become an economic reality.

16243 **(CEA-CONF—8483) Ductility of materials under dynamic solicitations.** Dormeval, R.; Ansart, J.P. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Jun 1986. 17p. (In French and English). (CONF-860616—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750572.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

We present some aspects of the measurement of the material ductility at high strain-rates (> equal to 10^3 s^{-1}). After a short recall of the experimental methods, we show the results obtained on several materials by means of dynamic tensile tests and explosive expanding shells. These results are discussed in regard to the mechanisms of deformation, and to the parameters which can influence the evolution of ductility. Examples are given for copper, aluminium alloys, titanium alloys and uranium alloys: UMo 1.5 and UV 0.2.

16244 **(CEA-CONF—8553) European effort on materials.** Ehrlich, K.; Calza Bini, A.; Brown, C.; Lippens, M.; Levy, V. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1986. 17p. (CONF-860931—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750557.

From International conference on reliable fuels for liquid metal reactors; Tucson, AZ, USA (7 Sep 1986).

The increase in target burnup needed to make the LMFBR economically competitive with other electrical energy sources is today mainly limited by the excessive swelling of the austenitic stainless steels used as cladding and wrapper tube materials, though the actual limits of commercial austenitic stainless steels have not yet been determined. Improved austenitic stainless steels, like higher Ni-bearing alloys and modified 15Cr-15Ni alloys, offer the short term possibility of an increase in burnup, which might approach the 18 - 20% h.a. (>150 dpa) set for SUPERPHENIX 2, SNR-2 and CDFR projects. High nickel alloys show acceptable swelling behaviour at high dose, but irradiation-induced embrittlement problems may limit their use. Ferritic/martensitic steels are swelling resistant but their low creep strength limits their application to wrapper tubes. EM10, FV448 and 1.4914 are considered promising steels with their susceptibility to low temperature embrittlement being controlled by optimization of chemical composition and thermal treatment. Oxide dispersion strengthened ferritic steels with high thermal creep resistance have been developed for cladding application. 26 refs.

16245 **(CEA-CONF—8562) Principal modes of rupture encountered in expertise of advanced components.** Tavassoli, A.A.; Bougault, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1986. 8p. (In French). (CONF-861027—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750473.

From 5. international conference on reliability and maintainability; Biarritz, France (6 Oct 1986).

Failure of many metallic components investigated can be classified into two categories: intergranular or transgranular according to their principal mode of rupture. Intergranular ruptures are often provoked by segregation of impurities at the grain boundaries. Three examples are cited where this phenomenon occured, one of them is a steel (A 508 cl 3) used for PWR vessel. Intergranular failures are in general induced by fatigue in the advanced components operating under thermal or load transients. One example concerning a sodium mixer which was subjected to thermal loadings is presented. Examples of stress corrosion and intergranular sensitization failures are cited. These examples show the importance of fractography for the determination of rupture causes.

16246 **(CEA-CONF—8563) Surface quenching of zirconium alloys by laser.** Richard, A.; Charissoux, C.; Calvet, J.N. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1986. 5p. (In French). (CONF-8610153—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750474.

From Autumn metallurgy meeting; Paris, France (14 Oct 1986).

Nodular type corrosion of Zircaloy occurs in aqueous media at high temperature, an improvement is obtained by quenching from the β domain or even $\alpha + \beta$ because of fine structure, size and distribution of precipitates. Surface heat treatments improve corrosion resistance, mechanical properties are preserved by non-transformed alloy. Very fast heat treatment is required to avoid damage to the underlying structure, laser beam allows a high energy treatment in very short time. Penetration versus laser power and microhardness versus depth of treatment and structure are examined.

16247 **(CONF-860789—4) Computer simulation of "special" grain boundaries in metals and ionic materials.** Wolf, D. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004989.

From International workshop on condensed matter theories; Argonne, IL, USA (21 Jul 1986).

In recent years a set of lattice statics computer codes has been developed which permits one to determine the energies, structures, and point-defect properties of grain boundaries in metals and predominantly ionic ceramic materials. In contrast to metals, long-range Coulomb forces between the ions have to be considered in ionic bicrystals. The selection criteria for the identification of "special" (i.e., low-energy) grain boundaries (GBs) is discussed with particular emphasis on (1) the role of the GB plane, (2) the influence of the planar unit-cell area, and (3) the effect of the interatomic potential on the predicted energies and structures of GBs in metals and ionic materials.

16248 **(CONF-860953—5) Atomic-defect mechanisms for diffusion in refractory bcc metals.** Siegel, R.W.; Mundy, J.N.; Smedskjaer, L.C. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004653.

From International conference on vacancies and interstitials in metals and alloys; Berlin, F.R. Germany (14 Sep 1986).

Despite a number of recent investigations into the nature and properties of equilibrium atomic defects in the refractory bcc metals, the mechanisms responsible for the high-temperature mass transport in these materials are not clear. The observed strong high-temperature enhancement in self-diffusion appears to be unexplainable in terms of divacancies, but might result from the presence of small equilibrium concentrations of highly-mobile self-interstitials. Recent vacancy formation measurements in Cr appear to support this view. However, recent studies of diffusion in Nb(W) alloys and high-temperature vacancy migration in W have raised new issues to be considered.

16249 **(CONF-860953—6) Diffusion and ion mixing in amorphous alloys.** Hahn, H.; Averback, R.S.; Ding, F.; Loxton, C.; Baker, J. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004677.

From International conference on vacancies and interstitials in metals and alloys; Berlin, F.R. Germany (14 Sep 1986).

Tracer impurity diffusion and ion beam mixing in amorphous (a-)$Ni_{50}Zr_{50}$ were measured. A correlation between the metallic radius of an impurity and its tracer diffusivity was observed; it is similar to that found in crystalline α-Zr and α-Ti. In addition, the temperature dependence of diffusion in a-NiZr exhibits Arrhenius behavior. Ion beam mixing of different impurities in a-NiZr correlates with tracer diffusivity at both high and low temperatures. At higher temperatures radiation enhanced diffusion (RED) was observed. The activation enthalpy of the RED diffusion coefficient is 0.3 eV/atom.

16250 **(CONF-860953—7) Production of freely-migrating defects during irradiation.** Rehn, L.E.; Okamoto, P.R. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004652.

From International conference on vacancies and interstitials in metals and alloys; Berlin, F.R. Germany (14 Sep 1986).

During irradiation at elevated temperatures, vacancy and interstitial defects that escape can produce several different types of microstructural changes. Hence the production rate of freely-migrating defects must be known as a function of irradiating particle species and energy before quantitative correlations can be made between microstructural changes. Our fundamental knowledge of freely-migrating defect production has increased substantially in recent years. Critical experimental findings that led to the improved understanding are reviewed in this paper. A strong similarity is found for the dependence of freely-migrating defect production on primary recoil energy as measured in a variety of metals and alloys by different authors. The efficiency for producing freely-migrating defects decreases much more strongly with increasing primary recoil energy than does the efficiency for creating stable defects at liquid helium temperatures. The stronger decrease can be understood in terms of additional intracascade recombination that results from the nonrandom distribution of defects existing in the primary damage state for high primary recoil energies. Although the existing data base is limited to fcc materials, the strong similarity in the reported investigations suggests that the same dependence of freely-migrating defect production on primary recoil energy may be characteristic of a wide variety of other alloy systems as well. 52 refs., 4 figs.

16251 **(CONF-860953—8) Calculation of the properties of vacancy clusters in copper using a new, efficient energy minimization scheme.** Sabochick, M.J.; Yip, S.; Lam, N.Q. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering; Argonne National Lab., IL (USA)). Dec 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004845.

From International conference on vacancies and interstitials in metals and alloys; Berlin, F.R. Germany (14 Sep 1986).

A modification of the Fletcher-Powell optimization method has been applied to the molecular statics calculation of migration and binding energies of vacancy clusters in copper. Using a recently developed pseudopotential, the tri- and tetravacancy migration energies were found to be 0.56 eV and 0.38 eV, respectively. The collapse of hexagonal and triangular platelets of 10 or more vacancies was found to result in hexagonal faulted loops and stacking fault tetrahedra, respectively, the latter being more stable in the sense of having a higher binding energy. The displacement field in the near vicinity above the loops showed significant deviations from the predictions of anisotropic linear elasticity theory.

16252 **(CONF-860953—10) Vacancy migration enthalpy in tungsten at high temperatures.** Mundy, J.N.; Ockers, S.T.; Smedskjaer, L.C. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004664.

From International conference on vacancies and interstitials in metals and alloys; Berlin, F.R. Germany (14 Sep 1986).

The curvature found in the Arrhenius plot for tungsten self-diffusion has been commonly interpreted in terms of simultaneous diffusion by two different defect processes. An alternative interpretation has been made in terms of the temperature dependence of the migration enthalpy and/or the formation enthalpy for single vacancies. In order to study the magnitude of the temperature dependence for the migration enthalpy, the present interrupted quenching experiments studied the annealing of a supersaturation of vacancies at high temperatures in tungsten. The temperature dependence of H/sup m//sub 1v/ found in the present experiments is insufficient to explain the Arrhenius curvature found for self-diffusion in tungsten. However, the curvature could be explained if the formation enthalpy, H/sup f//sub 1v/ had a temperature dependence of similar magnitude.

16253 **(CONF-861068—16) The corrosion of metals and alloys by sodium polysulfide melts at 350°C.** Brown, A.P.; Battles, J.E. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 2p. NTIS, PC A02. File Number DE87005028.

From Electrochemical Society fall meeting; San Diego, CA, USA (19 Oct 1986).

In conclusion, based solely on consideration of corrosion resistance, molybdenum is the only metal or alloy that can be recom-

mended as a positive current collector/container material for the Na/S cell. If the metal or alloy were to be used as a substrate for a corrosion resistant coating, then the best metal or alloy to provide adequate protection against coating defects, would be a stainless steel with a composition near to Fe-^{26}Cr-^{3}Mo, such as Ferralium 255.

16254 **(CONF-861111—18) Magnetic properties of novel epitaxial films.** Bader, S.D.; Moog, E.R. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004744.

From Conference on magnetism and magnetic materials; Baltimore, MD, USA (17 Nov 1986).

The surface magneto-optic Kerr effect (SMOKE) is used to explore the magnetism of ultra-thin Fe Films extending into the monolayer regime. Both bcc α-Fe and fcc γ-Fe single-crystalline, multilayer films are prepared on the bulk-terminated (1 x 1) structures of Au(100) and Cu(100), respectively. The characterizations of epitaxy and growth mode are performed using low energy electron diffraction and Auger electron spectroscopy. Monolayer-range Fe/Au(100) is ferromagnetic with a lower Curie temperature than bulk α-Fe. The controversial γ-Fe/Cu(100) system exhibits a striking, metastable, surface magnetic phase at temperatures above room temperature, but does not exhibit bulk ferromagnetism.

16255 **(CONF-861111—19) Magnetic phase transitions in nanocrystalline erbium.** Cowen, J.A.; Stolzman, B.; Averback, R.S.; Hahn, H. (Michigan State Univ., East Lansing (USA). Dept. of Physics; Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004724.

From Conference on magnetism and magnetic materials; Baltimore, MD, USA (17 Nov 1986).

Nanocrystalline samples of 99.9% pure erbium with particle sizes between 10 and 70 nm have been produced by the inert gas condensation technique. Magnetic susceptibility measurements on samples compacted to between 50 and 75% of bulk density indicate a modification in the high temperature phases and superparamagnetic behavior at low temperatures. ESR signals near g = 10 are probably due to Er compounds which may form during the production process.

16256 **(CONF-861185—2) Phases in U-Si alloys.** Domagala, R.F. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004830.

From Reduced Enrichment for Research and Test Reactors (RERTR) program international meeting; Gatlinburg, TN, USA (3 Nov 1986).

The binary (two component) U-Si system contains a total of seven "compounds." The most U-rich compounds are of interest to the RERTR community because they are now being employed as fuels in research and test reactors. The nomenclature used in describing these fuels and the metallurgical significance of the notations recorded may have different meanings to people from different technical backgrounds. This paper is a succinct exploration of the principles of phase equilibria and the realities of commerical fabrication as applied to U-Si alloys. It is an attempt to record in referenceable and retrievable form information of value to the continued development, application and understanding of silicide fuels.

16257 **(CONF-861207—43) Detection of near-surface ^{52}Cr segregation in irradiated ^{51}V(Cr) by RBS [Rutherford Backscattering Spectrometry].** Rehn, L.E.; Baldo, P.M. (Argonne National Lab., IL (USA)). Nov 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004684.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Irradiation at elevated temperatures of V(Cr) alloys is known to create a near-surface layer of nonequilibrium Cr enrichment. Highly reproducible RBS spectra were accumulated from a V-15%Cr alloy irradiated at 750°C, and from unirradiated portions of the same specimen. Differences between these spectra are used to demonstrate the high sensitivity of conventional RBS techniques for determining near-surface segregation behavior. Sensitivities obtained utilizing differences in the acquired spectra are much higher than those typically assumed for RBS measurements. Using 1.8 MeV ^{4}He, and conventional RBS equipment and scattering geometries, segregation of ≦2 atomic layers of ^{52}Cr in ^{51}V-15 at. %Cr over a depth of ~5 nm has been observed.

16258 **(CONF-861207—46) Effect of aluminum addition on ductility and yield strength of Fe_3Al alloys with 0.5 wt % TiB_2.** McKamey, C.G.; Horton, J.A.; Liu, C.T. (Oak Ridge National Lab., TN (USA)). Dec 1986. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004621.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Studies have been conducted of the mechanical properties of Fe_3Al alloys containing 24 to 30 at. % Al, to which 0.5 wt % TiB_2 was added for grain refinement. In tensile tests conducted at room temperature, it has been found that, as the aluminum content is increased, the yield strength decreases sharply from 760 to 310 MPa. The decrease in yield strength is accompanied by a four-fold increase in room-temperature ductility. Ordered iron aluminides (containing no disordered α phase) showed a clear increase in yield strength with temperature above 300°C. Their strength reached a maximum around 600°C, above which it decreased sharply. All these results are discussed and correlated with stability of superlattice dislocations as a function of aluminum content.

16259 **(CONF-861207—48) The role of energetic displacement cascades in ion beam modifications of materials.** Averback, R.S.; Kim, S.J.; Diaz de la Rubia, T. (Argonne National Lab., IL (USA); California Inst. of Tech., Pasadena (USA); State Univ. of New York, Albany (USA)). Dec 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004721.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

The roles of energetic displacement cascades are ubiquitous in the fields of radiation damage and ion beam modifications of materials. These roles can be described on two time scales. For the first, which lasts $\approx 10^{-11}$ s, small cascade volumes are characterized by large supersaturations of point defects and energy densities in excess of some tenths of eV's per atom. During this period, the system can be driven far from equilibrium with significant rearrangement of target atoms and the production of Frenkel pairs. Studies of ion beam mixing in conjunction with molecular dynamics computer simulations, have contributed largely toward understanding these dynamic cascade processes. At later times, the microstructure of the material evolves as cascades begin to overlap, or at elevated temperatures, point defects migrate away from their nascent cascades. It is shown how the primary state of damage in cascades influences this microstructural development. Examples involving radiation enhanced diffusion and ion-induced amorphization are discussed. 40 refs.

16260 **(CONF-861207—49) Elastic properties of superlattices.** Grimsditch, M. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004835.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

A calculation of the effective elastic moduli of a superlattice, in terms of the elastic moduli of its constituents, is presented. Contrary to what has been found in many real systems, these calculations show that in the long wavelength limit the effective elastic moduli are independent of the modulation wavelength. A discussion of the experimental results on Nb/Cu, Mo/Ni and Au/Cr shows that the elastic anomalies can be understood on the basis of concomitant changes in lattice spacings.

16261 **(CONF-861207—50) Formation of submicron metastable phase structures in alloys with focused electron or proton beams.** Lam, N.Q.; Okamoto, P.R.; Leaf, G.K. (Argonne National Lab., IL (USA)). Nov 1986. Contract W-31109-ENG-38. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004722.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Recent theoretical and experimental studies of radiation-induced segregation in alloys under irradiation with focused charged-particle beams have shown that point-defect currents generated by axial and radial displacement-rate gradients can cause significant redistribution of the alloying elements within the irradiated zone. In the case of irradiation of thin films with highly-focused electron beams, two important features have been established experimentally: (1) the diameter of the local region in which the alloy composition and phase are modified is practically equal to the beam diameter, and (2) the time required to produce a given change in the alloy composition in the center of the irradiated zone decreases rapidly with beam diameter. Our theoretical modeling indicates that these features will also be observed in semi-infinite alloys bombarded with focused proton beams. However, in this case, the spatially-nonuniform defect production in both the axial and radial directions renders the compositional redistribution more complex. The present work shows that the ability to locally modify the alloy composition by focused electron or proton beams may offer a new method for producing local regions of controlled composition and microstructure on a submicron scale. The results of our model calculations and experimental studies will be presented to demonstrate the feasibility of this novel technique.

16262 **(CONF-861207—51) Precipitation of Kr in Ni at room temperature.** Birtcher, R.C.; Liu, A.S. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004723.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

The fluence dependence of Kr precipitation in Ni at room temperature has been studied with the aid of Transmission Electron Microscopy. As in other metals, the Kr precipitates in small cavities. Electron diffraction demonstrates that the Kr precipitates are solid, fcc crystals aligned with each other and the Ni lattice. The trends are similar to those observed for Kr precipitation in Al at room temperature. The average Kr lattice parameter, determined from the electron diffraction, increases with increasing Kr fluence from 0.515 nm to an asymptotic value of 0.545 nm. The asymptotic limit is due to the melting of the larger Kr precipitates. The mismatch between the Kr and Ni lattices is as large as 55%. Diffuse electron scattering was observed from large, liquid, Kr precipitates. This occurs for Kr fluences above 5×10^{20} $Kr^{+}m^{-2}$ in Ni and above 2.5×10^{20} $Kr^{+}m^{-2}$ in Al. At room temperature, the largest solid Kr precipitate observed in dark field images was 8.3 nm in diameter compared to 4.7 nm in Al. The larger precipitates are liquid or gas. The solid Kr metals at the same lattice parameter in both Ni and Al suggest that the melting is thermodynamic in nature and independent of the host material.

16263 **(CONF-861207—52) Effects of gamma radiolysis on waste package components.** Lewis, M.A.; Reed, D.T. (Argonne National Lab., IL (USA); Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004866.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

Short-term experiments which studied the effect of gamma radiation on the waste package components of a basaltic repository were completed. Experimental parameters were similar to those expected during the saturated post-closure period of the repository, i.e., a temperature of 200°C and a hydrostatic pressure $\geq$ 70 bar. The waste package components included low carbon steel pressure vessels, synthetic ground water formulation (GR4), CH_4, basalt or packing, and low carbon steel coupons. It was found that gamma radiation at a dose rate of 10^4 rad/h for a duration of one and two months increased the H_2 yield in all tests. Increases in the organic carbon yield, the sulfate ion concentration, and the corrosion rate of the coupon were observed in some of the tests. These latter results varied with the combination of waste package components included in the tests. Evidence for the quench effect was observed in tests which included basalt.

16264 **(CONF-861207—58) Ductility and fracture behavior of polycrystalline Ni_3Al alloys.** Liu, C.T. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 13p. NTIS MF A01; 2; GPO Dep. File Number DE87005340.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

This paper provides a comprehensive review of the recent work on tensile ductility and fracture behavior of Ni_3Al alloys tested at ambient and elevated temperatures. Polycrystalline Ni_3Al is intrinsically brittle along grain boundaries, and the brittleness has been attributed to the large difference in valency, electronegativity, and atom size between nickel and aluminum atoms. Alloying with B, Mn, Fe, and Be significantly increases the ductility and reduces the propensity for intergranular fracture in Ni_3Al alloys. Boron is found to be most effective in improving room-temperature ductility of Ni_3Al with $<$24.5 at. % Al. The tensile ductility of Ni_3Al alloys depends strongly on test environments at elevated temperatures, with much lower ductilities observed in air than in vacuum. The loss in ductility is accompanied by a change in fracture mode from transgranular to intergranular. This embrittlement is due to a dynamic effect involving simultaneously high localized stress, elevated temperature, and gaseous oxygen. The embrittlement can be alleviated by control of grain shape or alloying with chromium additions. All the results are discussed in terms of localized stress concentration and grain-boundary cohesive strength. 55 refs., 10 figs., 3 tabs.

16265 **(DOE/ER/45091—3) Spin polarized photoelectron studies of magnetism in solids: Progress report for period June 1, 1986-May 31, 1987.** Rothberg, G.M. (Stevens Inst. of Tech., Hoboken, NJ (USA). Dept. of Materials and Metallurgical Engineering). Jan 1987. Contract FG02-84ER45091. 23p. NTIS, PC A02. File Number DE87005658.

The photoemission EXAFS (PEXAFS) technique has been applied to the early stages of the oxidation of aluminium. This work demonstrates the unique chemical sensitivity of PEXAFS. The near neighbor Al-O and Al-Al interatomic distances have been determined for the environments giving rise to unshifted and chemically shifted Al 2p photopeaks. Appreciable amounts of oxygen may be near an Al atom without shifting the electron binding energies and so previous measurements of others making use of the O ls extended fine structure have been misinterpreted. The first use of surface and bulk plasmon-loss electrons for EXAFS has been made. These losses are predominately by extrinsic plasmon production. An attempt was made to carry out the first PEXAFS experiment at the Berlin synchrotron radiation laboratory BESSY and this work will probably be continued. A procedure was developed for preparing thin, conducting films of MnO and spin polarized EXAFS (SPEXAFS) measurements were carried out at NSLS on MnO using the exchange split Mn 3s photopeaks and the 3p peaks. These data are being analyzed. We plan to soon put into operation facilities for MBE and for studying surface structure by means of electron energy loss extended fine structure.

16266 **(DOE/ER/45116—16) Theoretical investigation of twist boundaries in germanium.** Payne, M.C.; Bristowe, P.D.; Joannopoulos, J.D. (Massachusetts Inst. of Tech., Cambridge (USA)). Jan 1987. Contract FG02-84ER45116. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005360.

Results of the first completely ab-initio investigation of the microscopic structure of a grain boundary in a semiconductor are presented. Using the molecular dynamics simulated annealing method for performing total energy calculations within the LDA and pseudopotential approximations, the $\Sigma = 5(001)$ twist boundary in germanium is studied. A low energy structure is identified which exhibits a rigid body translation and a small contraction at the boundary.

16267 **(DOE/ER/45116—17) Lattice imaging study of grain boundaries at normal incidence to the boundary plane.** Mader, W.; Necker, G.; Babcock, S.E.; Balluffi, R.W. (Massachusetts Inst. of Tech., Cambridge (USA); Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.)). Feb 1987. Contract FG02-84ER45116. 6p. NTIS MF A01; 2; GPO Dep. File Number DE87005361.

The electron microscope lattice imaging technique has been widely used to study the atomistic structure of tilt grain boundaries. This note describes work in which information about the translational state of a boundary is obtained by the lattice imaging technique under conditions where the incident beam is aligned perpendicular to the boundary plane.

16268 **(DOE/ER/45255—1) Stress corrosion cracking and metal-induced embrittlement: Comparative studies of local chemistries: Progress report for period September 1, 1986-January 15, 1987.** Heldt, L.A.; White, C.L. (Michigan Technological Univ., Houghton (USA). Dept. of Metallurgical Engineering). Jan 1987. Contract FG02-86ER45255. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004300.

This parallel study of stress corrosion cracking (SCC) and metal-induced embrittlement (MIE) is directed toward understanding a number of interesting and unexplained similarities between these two phenomena. Initial experiments are focusing on the role of local chemistries at the crack tips, both in the environment and along the microstructural fracture path in the cracked material.

16269 **(EGG-M—18286) Microstructural response of rapidly solidified 304 stainless steel powder to three consolidation techniques.** Miley, D.V.; Flinn, J.E.; Fletcher, G.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1986. Contract AC07-76ID01570. 16p. (CONF-8608153—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87000439.

From International Metallographic Society conference on microstructural science; Boston, MA, USA (3 Aug 1986).

Some of the characteristics of rapidly solidified metals, such as reduced chemical segregation and extremely fine grain size, can result in improved material properties and performance. However, these same characteristics present a challenge to the metallographer examining the microstructures of these materials, and frequently more than one technique is required to characterize the features present. This paper describes the vastly different microstructure produced in centrifugally atomized 304 stainless steel powder after consolidation by three different processes: hot isostatic pressing, extrusion, and explosive consolidation. Characterization of microstructural features depended upon a combination of optical, scanning electron, and transmission electron techniques.

16270 **(ESA-CR(P)—262) Behavior of an Inconel 718 container in the presence of hydrogen. Final report.** Azou, P.Y.; Groos, M.; Grenet; Jounier; Wehling. (Ecole Centrale des Arts et Manufactures, 92 - Chatenay-Malabry (France)). Nov 1985. 57p. (In French). (ETN—86-98147). NTIS, PC A04/MF A01.

The properties of the Inconel 718 alloy in the presence of pressurized hydrogen are reviewed. A hydrogen container for space application is studied at different temperatures, determining the hydrogen loss and the fatigue resistance. The study includes a qualification procedure to test permeability and weld quality by the acoustic emission method. The test results indicate that permeability is low, and the mechanical resistance is above twice the utilization pressure.

16271 **(EUR—10124) Stress rupture properties of austenitic steel weld metals.** Wood, D.S. (Commission of the European Communities, Luxembourg). 1985. 40p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750548.

Elevated temperature stress rupture data on Mo containing and Mo free austenitic weld metals have been collected from French, Dutch, German and UK sources and the results analysed. The stress rupture strength of Mo containing weld metal is significantly higher than that of Mo free weld metal. At 10,000h the rupture strength of Mo containing weld metal is higher than that of Type 316 steel whereas the Mo free weld metal is about 20% lower than that of Type 304 steel. Austenitic weld metal can give low stress rupture ductility values. It is concluded that there are insufficient data to permit reliable extrapolations to long times and it is recommended that long-term tests are performed to overcome this situation. 8 refs, 2 tables, 22 figs.

16272 **(EUR—10125) Tensile properties of austenitic steel weld metals.** Wood, D.S. (Commission of the European Communities, Luxembourg). 1985. 40p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750547.

Elevated temperature tensile data on Mo containing and Mo free austenitic weld metals have been collected from French, German and UK sources and the results analysed. In the as welded condition the proof strength is significantly higher than that of wrought material and Mo containing weld metal is stronger than Mo free weld metal. The differences in UTS values are not so marked, and on average at temperatures above 400° the weld metal UTS is slightly lower than that of wrought material. The ductility of weld metal is significantly lower than that for wrought material. 7 refs, 2 tables, 20 figs.

16273 **(EUR—10126) Comparison of material property specifications of austenitic steels in fast breeder reactor technology.** Vanderborck, Y.; Van Mulders, E. (Commission of the European Communities, Luxembourg). 1985. 194p. NTIS (US Sales Only), PC A09/MF A01. File Number DE87750540.

Austenitic stainless steels are very widely used in components for European Fast Breeder Reactors. The Activity Group Nr. 3 "Materials", within Working Group "Codes and Standards" of the Fast Reactor Co-Ordination Committee of the European Communities, has decided to initiate a study to compare the material property specifications of the austenitic stainless steel used in the European Fast Breeder Technology. Hence, this study would allow one to view rapidly the designation of a particular steel grade in different European countries and to compare given property values for a same grade. There were dissimilarities, differences or voids appear, it could lead to an attempt to complete and/or to uniformize the nationally given values, so that on a practical level interchangeability, availability and use ease design and construction work. A selection of the materials and of their properties has been made by the Working Group. Materials examined are Stainless Steel AISI 304, 304 L, 304 LN, 316, 316 L, 316 LN, 316"Ti stab.", 316"Nb stab"., 321, 347.

16274 **(FEI—1657) Temperature-dose dependences of porosity parameters in nickel irradiated by 1 meV nitrogen ions.** Bagdinov, V.G.; Lebedev, S.Ya. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1985. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700697.

Temperature-dose dependences of swelling distribution functions for pore dimensions, average pore diameter pore concentration and total dislocation density in nickel irradiated by 1 MeV nitrogen ions are obtained. The expression which permits to describe with high accuracy the obtained temperature - dose dependence of swelling in nickel is indicated. 10 refs.; 5 figs.; 2 tabs.

16275 **(HEDL—7612) Corrosion of copper-based materials in gamma radiation.** Yunker, W.H. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1986. Contract AC06-76FF02170. 76p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005494.

The corrosion behaviors of pure copper (CDA 101), 7% aluminum-copper bronze (CDA 613) and 30% nickel-copper (CDA 715) are being studied in a gamma radiation field of 1 x 10^5 R/h. These studies are in support of the Nevada Nuclear Waste Storage Investigations (NNWSI) Project, by Lawrence Livermore National Laboratory (LLNL), of copper-based materials for possible use in container systems for the permanent geologic burial of nuclear waste. Weight loss, tear drop (stressed), and crevice specimens of the three materials were exposed to water vapor-air atmospheres at 95°C and 150°C and to liquid water at 95°C for periods of one, three, and six months. Longer exposures are in progress. Measure-

ments include: changes in the chemical composition of the gas and water, specimen weight changes, oxide film weights, evidence of microcracking and crevice corrosion, and chemical composition of the oxide films by Auger electron spectroscopy and x-ray diffraction. Interim results show considerable pit and under-film corrosion of alloys CDA 613 and CDA 715. Uniform corrosion rates range from 0.012 mil/yr (0.30 μm/yr) to 0.22 mil/yr (5.6 μm/yr), based on specimen weight losses during six- and seven-month exposures. The time dependencies will be determined as more data become available.

16276 **(HEDL—7627) Radiation embrittlement of manganese-stabilized martensitic stainless steel.** Gelles, D.S.; Hu, W.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Dec 1986. Contract AC06-76FF02170. 13p. NTIS MF A01; 2; GPO Dep. File Number DE87005493.

Fractographic examination has been performed on selected Charpy specimens of manganese stabilized martensitic stainless steels in order to identify the cause of irradiation embrittlement. Embrittlement was found to be partly due to enhanced failure at grain boundaries arising from precipitation. Microstructural examination of a specimen irradiated at higher temperature has demonstrated the presence of Fe-Cr-Mn chi phase, a body centered cubic intermetallic phase known to cause embrittlement. This work indicated that manganese stabilized martensitic stainless steels are prone to intermetallic phase formation which is detrimental to mechanical properties.

16277 **(HEDL-SA—3280-FP) Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys.** Garner, F.A.; Brager, H.R.; Dodd, R.A.; Lauritzen, T. (Hanford Engineering Development Lab., Richland, WA (USA); Wisconsin Univ., Madison (USA); General Electric Co., Sunnyvale, CA (USA)). Dec 1985. Contract AC06-76FF02170. 22p. (CONF-8510160—21). NTIS, PC A02/MF A01. File Number DE87004091.

From ASM metals congress/TMS-AIME fall meeting; Toronto, Ontario, Canada (13 Oct 1985).

It was recently discovered that Fe-Cr-Ni alloys with 35 +- 10 wt.% nickel decompose in a spinodal-like manner when irradiated with fast neutrons. This unexpected decomposition has many consequences. Not only do the anomalous properties characteristic of the Invar compositional regime disappear, but pronounced changes occur in both tensile properties and void swelling. Ion bombardment experiments have also been used to study void swelling and are now being used to study the decomposition. Microscopy and EDX examination of specimens employed in earlier void swelling studies confirm that ion irradiation induces spinodal-like decomposition in these alloys. The period and amplitude of the compositional fluctuations induced by irradiation are sensitive to temperature, nickel content and perhaps crystallographic direction, but are not very sensitive to chromium content or displacement rate.

16278 **(HEDL-SA—3319-FP) Fracture toughness of stainless steel welds.** Mills, W.J. (Hanford Engineering Development Lab., Richland, WA (USA)). Nov 1985. Contract AC06-76FF02170. 40p. (CONF-8607107—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004085.

From 19. national symposium on fracture mechanics; San Antonio, TX, USA (1 Jul 1986).

The effects of temperature, composition and weld-process variations on the fracture toughness behavior for Types 308 and 16-8-2 stainless steel (SS) welds were examined using the multiple-specimen J/sub R/-curve procedure. Fracture characteristics were found to be dependent on temperature and weld process but not on filler material. Gas-tungsten-arc (GTA) welds exhibited the highest fracture toughness, a shielded metal-arc (SMA) weld exhibited an intermediate toughness and submerged-arc (SA) welds yielded the lowest toughness. Minimum-expected fracture properties were defined from lower-bound J/sub c/ and tearing modulus values generated here and in previous studies. Fractographic examination revealed that microvoid coalescence was the operative fracture mechanism for all welds. Second phase particles of manganese silicide were found to be detrimental to the ductile fracture behavior because they separated from the matrix during the initial stages of plastic straining. In SA welds, the high density of inclusions resulting from silicon pickup from the flux promoted premature dimple rupture. The weld produced by the SMA process contained substantially less manganese silicide, while GTA welds contained no silicide inclusions. Delta ferrite particles present in all welds were substantially more resistant to local failure than the silicide phase. In welds containing little or no manganese silicide, delta ferrite particles initiated microvoid coalescence but only after extensive plastic straining.

16279 **(INIS-SU—370, pp 44-48) To the theory of radiation-induced pores in crystals.** Mirzoev, F.Kh.; Fetisov, E.P.; Shelepin, L.A. 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Mean time necessary for formation of a stable pore nucleus in an irradiated crystal oversaturated both by vacancies and interstitials is calculated. It is shown that interstitials affect essentially upon the process of stable pore generation increasing the mean time of their formation.

16280 **(JINR—E-14-85-284) Application of neutron time-of-flight diffraction to texture studies.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701332.

Submitted to workshop on experimental technique of texture analysis (Clausthal-Zellerfeld, FRG, March 25-29, 1985).

The application of neutron time-of-flight diffraction to texture investigation on polycrystalline solids is described. A composition with the stationary method shows the efficiency but also some disadvantages of the proposed technique. The texture diffractometer NSWR is described, which was going into operation at the pulsed reactor IBR-2. Selected experiments on metallic and geological specimens demonstrate the efficiency of neutron texture analysis using time-of-flight technique. 10 refs.; 10 figs.

16281 **(KFK—4137) Development of carbide sintering steels with high wear resistance.** Klausmann, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau). Oct 1986. 172p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87751303.

In systems, in which the carbide forming elements also form the liquid phase, here investigated with Fe-Mo-C, the proportion of the liquid phase and thus the densification is only hard to control, due to a necessary carbide content of ≧10 vol.%. In addition the carbide precipitates as a grain boundary phase. When NbC or TiC is used as the hard phase, the liquid phase was initiated by addition of P or P-C. Thereby in the system Fe-NbC-P or Fe-NbC-P-C a good densification was achieved. Analogous experiments with TiC showed insufficient sintered density, since the wettability of Fe-P on TiC was poor. A finely dispersed distribution of the NbC-phase was reached with the mechanical alloying by attrition. To get a sufficient compactibility for the attrited powder, it had to be annealed and the large flaky particles where mechanically crushed in the mixer. It is advantageous, that the NbC-content can be increased up to 30 vol.%, without influencing the sintering parameters and the matrix, since the carbide does not have any influence on the liquid phase. Furthermore the desired matrix can be achieved by variing the C-content or heat treatment, without influencing the carbide phase. The determined mechanical properties show, that the Fe-NbC-P-C material can be manufactured to meet a wide range of demands for wear resistant components. Abrasion wear tests showed, that the here developed material has at least the same abrasion wear resistance as commercial wear resistant materials. (orig./IHOE).

16282 **(LA—10700-MS) Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts.** Rense, C.E.C.; Fife, K.W.; Bowersox, D.F.; Ferran, M.D. (Los Alamos National Lab., NM (USA)). Jan 1987. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87004770.

As part of our effort to develop a semicontinuous PuO_2 reduction process, we are investigating promising materials for containing a 900°C molten $CaCl_2$. CaO chlorination reaction. We want the material to contain this reaction and to be reusable. We tested candidate materials in a simulated salt (no plutonium) using anhydrous HCl as the chlorinating agent. Data are presented on the performance of 36 metals and alloys, 9 ceramics, and 3 coatings.

16283 **(LA-UR—86-4347) The effect of the cube texture component on the earing behavior of rolled f.c.c. metals.** Rollett, A.D.; Canova, G.R.; Kocks, U.F. (Los Alamos National Lab., NM (USA); Metz Univ., 57 (France). Faculte des Sciences). 1986. Contract W-7405-ENG-36. 11p. (CONF-861076—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003757.

From Fall meeting of the Metallurgical Society of AIME; Orlando, FL, USA (5 Oct 1986).

An application of texture simulation to the formability of rolled f.c.c. sheet is described. Control of the earing behavior of such sheet is crucial to the efficient utilization of material. Cold-rolled f.c.c. metals characteristically give ears at 45° to the rolling direction but it is known that if a large cube component is present before the material is rolled, the severity of the earing is reduced. The cube component, (010)[001], by itself is known to give ears at 90° to the rolling direction and could thus balance a 45° earing tendency. The cube component is unstable to rolling deformation, however, and is generally not observed in heavily cold-rolled f.c.c. metals. Therefore, the challenge is to explain how a large cube component, present prior to rolling, can affect the earing behavior at large rolling reductions. Texture simulation shows that orientations near cube tend to rotate primarily about the rolling direction towards the Goss orientation, (110)[001]. It has been established both experimentally and theoretically that all orientations between the cube and the Goss positions give 90° ears. Therefore, the effect of a prior cube component is due to the special behavior of orientations near cube under rolling deformation.

16284 **(LA-UR—87-15) Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries.** Zirngiebl, E.; Thompson, J.D.; Smith, J.L.; Fisk, Z. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 5p. (CONF-870142—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005126.

From 5. international conference on valence fluctuations; Bangalore, India (5 Jan 1987).

Any impurity doping seems to modify the low temperature properties of UBe_{13} in a way rather unusual compared to normal superconductors. So far, however, little attention has been paid to the modification of the normal state properties of impurity doped UB_{13}. We have investigated the normal state magnetic behavior of impurity doped (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries (RE = Th, Y, La, Lu, Sc) in the temperature range between 2 K and 380 K for impurity concentrations $x \leqq 0.05$ to see if there are correlations with T/sub c/(x).

16285 **(LA-UR—87-16) Low temperature properties of $CeCu_5$ and related compounds.** Willis, J.O.; Aiken, R.H.; Fisk, Z.; Zirngiebl, E.; Thompson, J.D.; Ott, H.R.; Batlogg, B. (Los Alamos National Lab., NM (USA); Eidgenoessische Technische Hochschule, Zurich (Switzerland); Bell Labs., Murray Hill, NJ (USA)). 1987. Contract W-7405-ENG-36. 8p. (CONF-870142—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005125.

From 5. international conference on valence fluctuations; Bangalore, India (5 Jan 1987).

Magnetic susceptibility, specific heat, and thermal expansion of $CeCu_5$ indicate two phase transitions. Measurements on $CeAlCu_4$, $CeAl_2Cu_3$, $CeZn_2Cu_3$, and $CeAlZn_2Cu_3$ are also reported. (DLC)

16286 **(LYCEN—8445) Temperature influence during nitrogen implantation into steel.** Moncoffre, N.; Hollinger, G.; Jaffrezic, H.; Marest, G.; Tousset, J. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire). Jul 1984. 9p. (CONF-840760—22). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750581.

From Ion beam modification of materials conference; Ithaca, NY, USA (16 Jul 1984).

Nitrogen ion implantations in a XC06 steel are performed at different temperatures. The nitrogen profiles are measured using the narrow 429 keV resonance of the $^{15}N(p,\alpha\gamma)^{12}C$ nuclear reaction. The iron and nitrogen chemical states are determined by Conversion Electron Moessbauer Spectroscopy (CEMS). The chemical composition of the implanted layer is also studied by means of X-ray Photoelectron Spectroscopy (XPS). A strong variation of the nitrogen profiles is shown at temperatures between 20 and 200°C. This temperature effect differs from that of post annealings. The formation of a superficial peak due to epsilon-carbonitride phases increasing with temperature is observed for implantations performed from 100°C. An evolution of iron nitride and carbonitride phases is observed as a function of implantation temperature.

16287 **(N—87-11873) Grain boundary oxidation and fatigue crack growth at elevated temperatures. Final report.** Liu, H.W.; Oshida, Y. (Syracuse Univ., NY (USA)). Oct 1986. 30p. (NASA-CR—179529; NAS—1.26:179529). NTIS, PC A03/MF A01.

Fatigue crack growth rate at elevated temperatures can be accelerated by grain boundary oxidation. Grain boundary oxidation kinetics and the statistical distribution of grain boundary oxide penetration depth were studied. At a constant delta K-level and at a constant test temperature, fatigue crack growth rate, da/dN, is a function of cyclic frequency, nu. A fatigue crack growth model of intermittent micro-ruptures of grain boundary oxide is constructed. The model is consistent with the experimental observations that, in the low frequency region, da/dN is inversely proportional to nu, and fatigue crack growth is intergranular.

16288 **(N—87-11875) Primary arm spacing in chill block melt spun Ni-Mo alloys.** Tewari, S.N.; Glasgow, T.K. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 21p. (NASA-TM—88887; E—3297; NAS—1.15:88887; CONF-861063—3). NTIS, PC A02/MF A01.

From American Society of Metals materials week; Lake Buena Vista, FL, USA (6 Oct 1986).

Chill block melt spun ribbons of Ni-Mo binary alloys containing 8.0 to 41.8 wt % Mo have been prepared under carefully controlled processing conditions. The growth velocity has been determined as a function of distance from the quench surface from the observed ribbon thickness dependence on the melt puddle residence time. Primary arm spacings measured at the midribbon thickness locations show a dependence on growth velocity and alloy composition which is expected from dendritic growth models for binary alloys directionally solidified in a positive temperature gradient.

16289 **(N—87-11889) Mechanical properties of various alloys in hydrogen. Final report.** Weeks, N.L.; Mucci, J. (United Technologies Corp., East Hartford, CT (USA)). Jun 1986. 30p. (NASA-CR—178874; NAS—1.26:178874; FR—19269). NTIS, PC A03/MF A01.

Notch tensile tests were conducted to determine the tensile strength of experimental alloys proposed for use in a pressurized gaseous hydrogen environment. The experimental alloys were processed and supplied by the Marshall Space Flight Center. They were supplied in four groups: nickel-base alloys, iron-base alloys, beryllium alloys, and the single-crystal alloy PWA 1480 in seven crystallographic orientations. Testing of the nickel-base, iron-base, and beryllium alloys established the comparative ambient temperature notch tensile strength in 34.5 MPa (5000 psig) gaseous hydrogen environment. After the test results were documented and reported, the test specimens were returned for evaluation. Testing of the single-crystal alloy, PWA 1480, established the notched tensile strength for the various crystallographic orientations in 34.5 MPa (5000 psig) gaseous helium and hydrogen environments at 871 C (1600 F). Strengths established in hydrogen were compared to those in helium to determine environmental degradation due to hydrogen. For the nickel-base alloys, iron-base alloys, and the beryllium alloys, environmental degradation could not be established as no helium environment tests were conducted.

16290 (N—87-12357) Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986. Halicioglu, T. (Eloret Corp., Sunnyvale, CA (USA)). Oct 1986. 6p. (NASA-CR—177046; NAS—1.26:177046). NTIS, PC A02/MF A01.

During this reporting period three investigations were carried out. The first area of research concerned the analysis of the structure-energy relationship in small clusters. This study is very closely related to the improvement of the potential energy functions which are suitable and simple enough to be used in atomistic simulation studies. Parameters obtained from ab initio calculations for dimers and trimers of Al were used to estimate energetics and global minimum energy structures of clusters continuing up to 15 Al atoms. The second research topic addressed modeling of the collision process for atoms impinging on surfaces. In this simulation study qualitative aspects of the O atom collision with a graphite surface were analyzed. Four different O/graphite systems were considered and the aftermath of the impact was analyzed. The final area of investigation was related to the simulation of thin amorphous Si films on crystalline Si substrates. Parameters obtained in an earlier study were used to model an exposed amorphous Si surface and an a-Si/c-Si interface. Structural details for various film thicknesses were investigated at an atomistic level.

16291 (ND-R—1224(R)) Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack. Sharples, J.K. (UKAEA Risley Nuclear Power Development Labs.). Jul 1985. 45p. UKAEA (Northern Division), Risley, Warrington WA3 6AT. File Number TI87900473.

Work performed under United States-UKAEA Fast Reactor Exchange Program.

A large rotating cylinder rig has been proposed by the UKAEA to investigate the fracture of heavy section steel under mechanical and thermal loads, and a small scale prototype has been built to demonstrate its feasibility. Elastic-plastic finite element analyses have been carried out of the prototype rotating cylinder (containing a full length axial crack along the bore) in order to establish the extent of yielding in the cylinder with increasing rotational speed. Both the BERSAFE and ABAQUS finite element computer codes have been utilized for the assessment, and in the case of the former, values of J and the modified integral J* have been evaluated. The stress-strain relationship was idealized as elastic-perfectly plastic. The main conclusions are that for an internal axial crack extending half way through the wall of the cylinder (a/w = 0.5), the cracked ligament will yield at a rotational speed of between 5893 and 6690 rpm, and that the cylinder will become fully plastic at approximately 8000 rpm. These values compare favorably with those evaluated from calculation methods previously proposed. The validity of the earlier calculational methods has also been demonstrated for crack lengths (a/w) of 0.4 and 0.55 considered in the investigation. By assuming a fracture toughness (K/sub IC/) value of 200 MPa $\sqrt{m}$ for the material the results from the J and J* integral solutions indicate that crack growth may result from the a/w = 0.5 crack at rotational speeds exceeding 6000 rpm.

16292 (NIIAR—19(665)) Technique and preliminary results for in-reactor investigation of corrosion and mechanical behaviour of zirconium alloys under non-isothermal conditions. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701341.

Technique for investigation of corrosion resistance of zirconium alloys in the overheated water steam environment in the channel of experimental reactor is proposed. The device developed permits to irradiate samples at 300-1000 deg C. Preliminary results of investigation of corrosion resistance of zirconium alloys doped with Nb, Fe, Cr, W are presented to ground the technique possibilities. Some advantage of intermetallic type alloys under the conditions of short-time overheatings up to 1000 deg C is established. Statistical confirmation of the given fact is required. 5 refs.; 6 figs.; 1 tab.

16293 (ORNL/M—294) Soft x-ray emission studies of several aluminum alloys. Tsang, K.L.; Zhang, C.H.; Callcott, T.A.; Arakawa, E.T.; Ederer, D.L.; Biancaniello, F.; Curelaru, I. (Tennessee Univ., Knoxville (USA). Dept. of Physics; Oak Ridge National Lab., TN (USA); National Bureau of Standards, Washington, DC (USA); Utah Univ., Salt Lake City (USA). Dept. of Physics). 23 Sep 1986. Contract AC05-84OR21400. 2p. NTIS, PC A02. File Number DE87005232.

During the first few months of operation of our soft x-ray spectrometer at the NSLS, we have measured the L emission spectrum for three classes of aluminum alloys: dilute aluminum-magnesium alloys to extend the Al-Mg system to the impurity limit; a 50-50 alloy of aluminum-lithium to characterize the band structure of bulk samples of this potential battery electrolite; and the icosahedral and normal Al-Mn alloys to see if the two phases had measurably different density of states which have been predicted. All spectra shown are produced when core holes generated by energetic electrons or photons are filled by radiative transitions from conduction band states. Dipole selection rules govern the transitions. Thus, K spectra provide a measure of the p-symmetic partial density of states (DOS) near the atom. Similarly, L spectra produced by transitions to p-core holes map the s and d symmetric DOS in the vicinity of the atom with the core hole.

16294 (PNL-SA—14033) XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion. Baer, D.R.; Dake, L.S. (Pacific Northwest Lab., Richland, WA (USA)). Jan 1987. Contract AC06-76RL01830. 33p. (CONF-861063—2). NTIS, PC A03. File Number DE87004919.

From American Society of Metals materials week; Lake Buena Vista, FL, USA (6 Oct 1986).

This paper describes the basic principles of five surface and near surface analysis methods and explores ways they can be used to gather information relevant to oxidation and high temperature corrosion. The techniques discussed include: Auger electron spectroscopy, x-ray photoelectron spectroscopy, Rutherford backscattering spectroscopy, nuclear reaction analysis and laser Raman spectroscopy. Advantages and limitations of each method are highlighted. To illustrate the types of information available, four of the techniques have been used to examine the oxide formed on a nickel-chromium-thoria alloy. Other examples, original and from the literature, are used to demonstrate special characteristics of the techniques. Particular attention is devoted to the possibilities and limitations of high temperature studies in ultra high vacuum analytical systems.

16295 (RFP—4060) Inertia friction welding of 1100 aluminum to type 316 stainless steel. Yashan, D.; Tsang, S.; Johns, W.L.; Doughty, M.W. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant; Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)). 1986. Contract AC04-76DP03533. 38p. (CONF-8604123—3). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005044.

From 67. annual American Welding Society meeting; Atlanta, GA, USA (13 Apr 1986).

Joining 1100 aluminum to type 316 stainless steel by inertia friction welding was investigated. Weld quality was evaluated using a tensile specimen configuration designed to promote failure at the weld interface rather than in the aluminum base metal. Results from this work showed that good quality welds can be obtained within certain ranges of axial pressure (heating plus forge pressures), and specific energy, which is a function of flywheel moment of inertia, rotational speed, and total weld area. The use of a high specific energy led to the formation of a brittle intermetallic compound at the interface, resulting in a loss of weld strength. Three steel faying surface geometry variations were evaluated; they were found to only have a minor effect on strength. Comparisons of strength and hardness values between the inner and outer portions of the weld area revealed a variation in weld quality across the interface in most cases.

16296 **(SAND—86-2814C) Passivity of amorphous Ni-Cr-P alloys.** Diegle, R.B.; Clayton, C.R.; Helfand, M.; Sorensen, N.R. (Sandia National Labs., Albuquerque, NM (USA); State Univ. of New York, Stony Brook (USA)). 1987. Contract AC04-76DP00789. 4p. (CONF-870314—5). NTIS, PC A02/MF A01. File Number DE87003155.

From Corrosion '87; San Francisco, CA, USA (9 Mar 1987).

Addition of Cr to Ni-20P at levels of 3 and 10 at.% enhances passivation in 0.2N HCl. XPS shows no evidence of oxidized Ni species, suggesting that the passivating film contains Cr_2O_3, $Cr(OH)_3^-$, and minor quantities of Cr^{6+} ion. P is present on the surface as H_3PO_3, PO_4^{-3}, and H_2PO_2. The existence of $H_2PO_3^-$ indicates that the barrier film may be responsible for the presence of this ionic species, such as reducing the concentration of water available at the metal-film interface.

16297 **(SAND—86-2856C) Passivation of P-implanted Fe-Cr amorphous alloys.** Sorensen, N.R.; Diegle, R.B.; Picraux, S.T. (Sandia National Labs., Albuquerque, NM (USA)). 1987. Contract AC04-76DP00789. 2p. (CONF-870314—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003788.

From Corrosion '87; San Francisco, CA, USA (9 Mar 1987).

Passivation of implanted (100 keV P) and unimplanted Fe-Cr alloys in 0.1N H_2SO_4 with 0-500 ppM NaCl was studied. It was found that Cr and P interact to promote passivity. Increasing the Cr concentration from 6 to 8% changes the corrosion behavior, 10% Cr improves further the passivation. The effects of structure on the corrosion resistance of Fe-Cr were also studied.

16298 **(UCRL—53753) Electroforming with nickel, iron, and aluminum.** Lakner, J.F. (Lawrence Livermore National Lab., CA (USA)). 15 Jul 1986. Contract W-7405-ENG-48. 76p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005589.

This is a manual of practical operating instructions for electroforming with the Watts-type nickel, iron, and aluminum baths. Collected here, in one volume, are many of the supposedly "secret" principles used by different manufacturers of electroformed parts. The author details the methods used to produce several types of electroformed shapes with lengths up to 30 in. and diameters as large as 8 in. In this illustrated manual, the author describes the apparatus; outlines the physical properties of electroplating baths and step-by step plating operations; provides analyses of electroformed products; addresses the difficulties encountered in the electrolysis process; describes mandrel design; and defines the machining and grinding techniques used. The author also describes how to produce "steel" shapes from iron that has first been electroformed and then carburized on a TiC mandrel.

16299 **(UCRL—94386) Laser welding metallography.** Ferreira, J.L. (Lawrence Livermore National Lab., CA (USA)). 1986. Contract W-7405-ENG-48. 16p. (CONF-8608153—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004113.

From International Metallographic Society conference on microstructural science; Boston, MA, USA (3 Aug 1986).

The metallographic preparation of weld samples becomes an absolute necessity when laser welding ultra-small parts as small diameter thin wall tubing or postage stamp-size and smaller machined components. In such welding situations, only a metallographic cross section of the weld can show the amount of penetration and the configuration of the weld nugget in relation to the weld joint. Further, metallographic examination can show cracking and porosity in the weld nugget which is generally too small for detection by conventional x-raying techniques. The speed at which weld parameters can be ascertained is also of considerable value when a test part is made and the laser is held on simmer awaiting results. This paper deals with sample preparation of various fine components that have laser welded and will discusss techniques for obtaining the most information from a sample weld.

16300 **Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction.** Beard, B.C.; Ross, P.N. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **90**: No. 26, 6811-6817(18 Dec 1986). Contract AC03-76SF00098.

Highly dispersed Pt supported on carbon black was impregnated with titania and heated in an inert atmosphere. The amount of titania used was twice the stoichiometric amount required for the formation of the ordered alloy phase Pt_3Ti. The chemical state of Ti at various stages of heating was determined by X-ray photoelectron spectroscopy and by extended X-ray absorption fine structure (EXAFS) analysis. The formation of alloy phases could also be determined by conventional X-ray diffraction methods. The characterizations showed unambiguously the conversion of separate Pt and TiO_2 dispersed phases into Pt-Ti alloy phases at progressively higher heat treatment temperatures, eventually resulting in the formation of crystallites of the ordered (intermetallic) phase Pt_3Ti. On the basis of this observation and other related work in the literature, they present a model for the chemistry occurring during the formation of the SMSI state of Pt/TiO_2 catalysts.

16301 **Crystal structure stability and fission gas swelling in intermetallic uranium compounds.** Hofman, G.L. (Argonne National Lab., IL, USA). *Journal of Nuclear Materials;* **140**: No. 3, 256-263(Oct 1986). Contract W-31-109-ENG-38.

A correlation between fission-induced amorphization and the behavior of fission gases in intermetallic uranium compounds is proposed. Changes in fission-gas mobility and in the plastic flow rate of the fuel, that result from such a transformation, are likely to be responsible for the large fission-gas-driven swelling-rate increases that have been observed in certain fuels. This study attempts to assess the propensity for amorphization of intermetallic compounds as potential test-reactor fuels by means of their thermodynamic properties. The compound U/sub 6/Mn was thus identified as a probable candidate for a stable high-density intermetallic fuel to be used in dispersion-fuel elements.

16302 **Trapping of deuterium in argon-implanted nickel.** Frank, R.C.; Rehn, L.E.; Baldo, P. (Augustana College, Rock Island, IL). *Journal of Applied Physics;* **57**: No. 3, 845-848(1 Feb 1985).

Argon ions with energy 250 keV were implanted at fluences of 2×10^{16} cm^{-2} at temperatures of 500, 250, and 21°C, in the specimen of relatively pure polycrystalline nickel. Deuterium was introduced into the surface and implanted regions by making the specimen the negative electrode of an electrolytic cell containing 1-N pure deuterated sulfuric acid. Deuterium trapped in the vacancy complexes of the implanted regions was analyzed as a function of temperature using the vacancy complexes of the implanted regions was analyzed as a function of temperature using the $^2H(^3He, ^1H)^4He$ nuclear reaction during an isochronal annealing process. The results indicate that the types of traps and trap densities found in the regions implanted at 21 and 250°C were essentially identical while the trap density found in the region implanted at 500°C was approximately 40% of that found in the other regions. Math model comparison with the experimental results suggests the existence of at least two types of traps in each region. Trap binding enthalpies used in the math model to fit the experimental data were slightly higher for the region implanted with argon at 500°C than for the regions implanted at the lower temperatures. TEM studies revealed the presence of small voids in the region implanted at 500° as well as dislocation loops similar to those found in the regions implanted at the lower temperatures. 20 references, 2 figures.

16303 **Valence instabilities in amorphous rare earth compound films.** Croft, M.; Lu, F.; Melczer, M.E.; Zolandz, A.; Hall, G.; Spencer, E.G. (Rutgers Univ., Piscataway, NJ). *Journal of Magnetism and Magnetic Materials;* **47**: No. 48, 1-3(1985). Contract AS05-82ER12061.

The amorphous film analogs of several well-known crystalline mixed valent compounds ($CePd_3$, $CeAl_3$ and Ce(Cu/sub 1-x/Ni/sub x/)/sub y/ with y = 5) have been prepared by sputter deposition onto cryogenic substrates using intermetallic targets. The

authors will discuss characterization of the films with: X-ray diffraction, for short and long term amorphousness; L/sub III/ absorption spectroscopy, for Ce valence state; PIXE and X-ray absorption, for composition estimation; and temperature-dependent resistivity, to probe Kondo type spin fluctuations. 11 references, 4 figures.

16304 **Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy.** Spooner, S. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **41**: 89-94(1985). Contract AC05-84OR21400.

Coarsening kinetics was studied in a Al/sub 90.6/Li/sub 9.14/ alloy aged at 100°C, 128°C, 165°C, 178°C, and 209°C. The time-dependent behavior of the average precipitate radius followed t/sup 1/3/ behavior. The precipitate/matrix interfacial energy obtained from analysis of the kinetic constant was 0.015 J/M² and was largely independent of temperature. The scattering curves exhibit interparticle interference which prevents calculating a particle size distribution. 12 references, 3 figures, 3 tables.

16305 **Thermal annealing of vacancy and interstitial loops in ion irradiated copper.** Larson, B.C.; Noggle, T.S.; Barhorst, J.F. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **41**: 25-30(1985). Contract AC05-84OR21400.

X-ray diffuse scattering has been used to study the thermal annealing of vacancy and interstitial loops in Ni-ion irradiated copper. The diffuse scattering formalism is reviewed and diffuse scattering measurements are reported on liquid-He temperature Ni-ion irradiated copper after annealing to 40, 275, and 300°C. Size distributions are presented for vacancy and interstitial loops after each anneal and the thermal-induced changes are discussed in terms of loop dissolution and coalescence. 13 references, 4 figures, 1 table.

16306 **Time-resolved x-ray studies during pulsed-laser irradiation of Ge.** Tischler, J.Z.; Larson, B.C.; Mills, D.M. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **35**: 119-124(1985). Contract AC05-84OR21400.

Synchrotron x-ray pulses from the Cornell High Energy Synchrotron Source (CHESS) have been used to carry out nanosecond resolution measurements of the temperature distributions in Ge during UV pulsed-laser irradiation. KrF (249 nm) laser pulses of 25 ns FWHM with an energy density of 0.6 J/cm² were used. The temperatures were determined from x-ray Bragg profile measurements of thermal expansion induced strain on <111> oriented Ge. The data indicate the presence of a liquid-solid interface near the melting point, and large (1500-4500°C/μm) temperature gradients in the solid; these Ge results are analogous to previous ones for Si. The measured temperature distributions are compared with those obtained from heat flow calculations, equilibrium melting point are discussed. 6 references, 3 figures.

16307 **A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation.** Fluss, M.J.; Berko, S.; Chakraborty, B.; Hoffmann, K.R.; Lippel, P.; Siegel, R.W. (Materials Science and Technology Div., Argonne National Lab., Argonne, IL 60439). pp 257-259 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

One- and two-dimensional angular correlation of positron-electron annihilation radiation (1D and 2D-ACAR) data have been obtained between 293 and 903 K for single crystals of aluminum. The peak counting rates vs temperature, which were measured using the 1D-ACAR technique, provide a model independent value for the temperature dependence of the positron trapping probability. Using these results it is possible to strip out the Bloch state contribution from the observed 2D-ACAR surfaces and then compare the resulting defect ACAR surfaces to calculated 2D-ACAR surfaces for positrons annihilating from the Bloch, monovacancy, and divacancy-trapped states. The results of this comparison is that the presence of an increasing equilibrium divacancy population is consistent with the observed temperature dependence of ACAR data at high temperature in Al and that the present results when compared to earlier studies in Al indicate that the ratio of the trapping rates at divacancies and monovacancies is of order two.

16308 **Vacancies in thermal equilibrium in Nb.** Nielsen, B.; Lynn, K.G.; Hurst, J.; Vehanen, A.; Schultz, P.J. (Brookhaven National Lab., Upton, NY). pp 464-465 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

The authors have measured the diffusion of positrons in Nb(110) in the temperature range from 300K to 2450K utilizing a variable energy positron beam. The purpose was to study the vacancy formation. However, no significant sign of vacancy trapping was observed. This could be due to a high detrapping rate caused by a low positron binding energy or due to a high vacancy formation enthalpy H/sub IV//sup F/. The last possibility is consistent with recent studies of the vacancy migration and with calculation of the positron binding energy. In this case the authors find the H/sub IV//sup F/ > 3 eV.

16309 **A positron annihilation doppler broadening study of niobium.** Smedskjaer, L.C.; Loper, G.D.; Chason, M.K.; Gerber, S.B.; Siegel, R.W. (Materials Science & Technology Div., Argonne National Lab., Argonne, IL 60439). pp 546-548 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

Doppler broadening of the positron annihilation lineshape has been measured for 99.995 wt. % pure niobium in the temperature range 300-2581 K. It was found that the effect of the equilibrium vacancies upon the Doppler-broadened lineshape in pure niobium is much smaller than that normally found for other metals, in agreement with an earlier study. Furthermore, the addition of 100 at. ppm oxygen to the niobium produced no measureable effects on the lineshape, within the experimental uncertainties, either within or below the vacancy-sensitive temperature region. The results are discussed in relation to previous investigations of positron trapping at vacancies in niobium, as well as to studies of vacancy migration in metals.

16310 **PAS determination of the vacancy formation enthalpy in tungsten.** Smedskjaer, L.C.; Chason, M.K.; Siegel, R.W. (Materials Science & Technology Div., Argonne National Lab., Argonne, IL 60439). pp 549-551 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

A measurement of the vacancy formation enthalpy in 99.999 wt. % pure tungsten under thermal equilibrium conditions was made using the positron annihilation spectroscopy (PAS) Doppler-broadening technique. Temperatures were measured by optical pyrometry, with calibrations against a W(Re) thermocouple, the tantalum melting point, and the power delivered to the sample. A trapping-model analysis of the PAS data from the temperature range 300-3633 K yielded a vacancy formation enthalpy of 3.76 +- 0.39 eV. Comparisons are made between the present result and the other available results on vacancy formation in tungsten.

16311 **Methane-bubble formation in hydrogen-charged Fe-30 ppm C.** Snead, C.L. Jr.; Lynn, K.G.; Suenaga, M. (Brookhaven National Lab., Upton, NY 11973). pp 552-554 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

The authors have used positrons as a probe of the early-stage growth of methane bubbles in hydrogen-charged polycrystal-

line Fe. Ferrovac E (30 ppm C) was charged at 900 psi of H/sub 2/ at 475°C for various times to generate the methane internally. It is known that this process generates methane bubbles. The results show that, even at very early bubble-growth stages, dislocations are generated. A lifetime definitely associated with trapping at bubbles is not observed, due either to trapping by dislocations that are generated and which can "screen" the bubbles, or be passivation of the bubbles as positron traps by the presence of hydrogen or methane in them.

16312 **High intensity positron beam and angular correlation experiments at Livermore.** Howell, R.H.; Fluss, M.J.; Rosenberg, I.J.; Meyer, P. (Lawrence Livermore National Lab., Livermore, CA). pp 801-803 of Positron annihilation. Jain, P.C.; Singru, R.M.; Gopinathan, K.P. Philadelphia, PA; World Scientific Pub. Co. (1985). (CONF-850169—).

From 7. international conference on positron annihilation; New Delhi, India (6 Jan 1985).

A positron beam apparatus that produces a variable energy positron beam with sufficient intensity to perform new positron experiments in an ultrahigh vacuum environment has been installed at the Lawrence Livermore 100 MeV electron linac. The authors have installed two large area position sensitive gamma-ray detectors to measure angular correlations in two dimensions and a separate highly collimated detector to measure positronium energy distributions by time-of-flight velocity determination. Data from measurements on single crystals of Cu are described.

16313 **Magnetization density of 5 f electrons in ferromagnetic PuSb.** Lander, G.H.; Delapalme, A.; Brown, P.J.; Spirlet, J.C.; Rebizant, J.; Vogt, O. (Argonne National Lab., IL). *Physical Review Letters;* **53**: No. 23, 2262-2265(3 Dec 1984).

The magnetization density of 5 f electrons in PuSb has been measured by use of a single crystal and polarized neutrons. The spatial extent of the spin and orbital densities is such that the form factor has a maximum at sin theta/$\lambda \sim 0.2$ A^{-1}. The ground-state wave function is deduced. Evidence for anisotropic interactions is presented. 14 references, 3 figures.

16314 **Effects of d-integral correlation on the mixed-valence properties of cerium systems: the integral-band problem.** Liu, S.H.; Ho, K.M. (Oak Ridge National Lab., IL). *Physical Review [Section] B: Condensed Matter;* **30**: No. 6, 3039-3046(15 Sep 1984). Contract AC05-84OR21400.

The d-integral correlation model, proposed by Liu and Ho to explain the double-peak photoemission spectrum of Ce, has been used to examine the integral-band problem in Ce-based mixed-valence materials. The problem is solved in the spinless approximation and under the assumption that the integral-level occupancy is nearly 1 on every Ce site. Two sets of d-integral hybridized bands, corresponding to the two screening states of integral^0 sites, have been found, and each set has two branches. At zero temperature, the upper branch of the upper set of bands has real energies, while all three other branches have complex energies. At finite temperatures, the quasiparticles in the upper branch also acquire a finite level width. This effect gives rise to a d-integral interaction contribution to the electrical resistivity whose temperature dependence satisfies a simple scaling relation. 15 references, 3 figures.

16315 **Adsorption of Ag on Ge(100)-(2 x 1).** Miller, T.; Rosenwinkel, E.; Chiang, T.C. (Univ. of Illinois at Urbana-Champaign). *Solid State Communications;* **50**: No. 4, 327-330(1984). Contract AC02-76ER01198.

The initial stages of interface formation of Ag deposited onto Ge(100)-(2 x 1) were studied with high-energy electron diffraction and high-resolution photoemission. The surface core-level energies for clean Ge(100)-(2 x 1) were not changed with the deposition of about one monolayer of Ag, indicating that there was no chemical reaction or atomic intermixing. The Ag nucleated at a coverage of about 1/3 monolayer and showed three-dimensional growth for higher coverages. 13 references, 3 figures.

16316 **Dose dependence of ion beam mixing of Au on amorphous and single crystalline Si and Ge.** Poker, D.B.; Holland, O.W.; Appleton, B.R. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **27**: 73-78(1984). Contract W-7405-ENG-26.

The rate of ion induced mixing of 700 A Au layers vapor deposited on amorphous and single crystalline Si substrates held at room temperature was measured as a function of dose using 300 keV Si, 350 keV Ar, and 525 keV Kr ion beams. Mixing profiles were measured at various fluences by Rutherford backscattering techniques and were found to be consistent with mixed layers whose thickness increased with ion dose. Mixing compositions, which were stoichiometric over the entire mixed region at Au-28.5 at. % Si, were found to be independent of ion species or implant fluence. For all ion species the dose dependence of mixing was closer to linear than the square root power law reported previously. In addition, the mixing rate for Au on single crystalline substrates was significantly higher than Au on substrates amorphized by Si (self-ion) implantation at liquid nitrogen temperature. No difference was found between the mixing rates when the amorphous substrates were prepared by room temperature implantation. Preliminary results indicate similar behavior for the Au/Ge couple. 4 figures, 17 references.

16317 **Surface modification of solids.** Appleton, B.R. (Oak Ridge National Lab., Oak Ridge, TN). pp 363-373 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—). Contract AC05-84OR21400.

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

The examples presented here merely suggest the potential of ion beam and laser processing for both fundamental materials studies and practical applications. Many of the fundamental ion beam mixing mechanisms leading to new materials properties are not well understood and need more detailed study. For example it is not clear why Au/Ge and Au/Si form amorphous mixtures at the same compositions as the metastable phases which result on thermal annealing; or why, despite the similarity of phase diagrams for Pd/Si and Pt/Si, that Pt/Si forms metastable phases while Pd/Si does not. Although the Au/Ge eutectic systems undergo prolific ion beam mixing at all temperatures, Al/Ge, which is also a eutectic system, does not mix at all. For practical applications ion beam and laser processing are appropriate for virtually any material and for alteration of any surface related phenomenon. The added dimension of these processing methods are their nonequilibrium capabilities which can lead to new surface alterations. Their primary limitation is the near-surface (<10 μm) modification depths.

16318 **Superconducting materials.** Finnemore, D.K. (Ames Lab., Iowa State Univ., Ames, IA 50011). pp 385-389 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

There are many applications of superconducting magnets ranging from the high field axicell coils of a mirror machine to the large volume but low field magnets in magnetohydrodynamics application. The conditions of operation are sufficiently different that many different conductor materials are needed. No one conductor material is sufficiently versatile to cover the range of requirements on temperature, magnetic field, ac loss and strain tolerance. More different kinds of conductors need to be brought to commercial viability. In addition to the superconducting materials problems there is a need for high-strength, high thermal conductivity structural materials. The stresses in these large magnets approach the yield stress of stainless steel and more work is needed to develop these high strength materials. There is a broad need for more basic research in the synthesis of composites having dimensions in the 10 nm range and for more detailed microcharacterization of these surfaces and interfaces.

16319 **Advanced metal alloys for energy needs.** Morris, J.W. Jr. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). pp 329 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—). Contract AC03-76SF00098.

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

This paper briefly covers three areas in which the systematic design of new metal alloys promises to solve important technical problems. It does not treat a host of parallel developments that are equally important and exciting in such areas as high-temperature structural alloys, oxidation, corrosion, and wear-resistant alloys, high-strength structural alloys, magnetic alloys and films, and electrical conductors and superconductors. But the pattern of development in each of these areas is basically the same: the coupling of fundamental science and materials characterization to clarify the microstructural sources of important engineering properties, then the systematic manipulation of microstructure to create new alloys that satisfy important engineering needs.

16320 **Fundamental corrosion characterization of high-strength titanium alloys.** Schutz, R.W.; Grauman, J.S. (TIMET Div., Titanium Metals Corp. of America, P.O. Box 2128, Henderson, NV 89015). pp 130-142 of Industrial applications of titanium and zirconium: 4th volume. Young, C.S.; Durham, J.C. Philadelphia, PA; ASTM (1984). (CONF-841009—).

From 4. symposium on titanium and zirconium in industrial applications; Philadelphia, PA, USA (10 Oct 1984).

Many commercially available and several developmental high-strength titanium alloys were evaluated for application in chloride-containing environments with respect to general, crevice, and stress corrosion resistance. Studies in boiling reducing and oxidizing acid chloride media permitted identification of certain high-strength titanium alloys, containing ≧4 weight % molybdenum, which are significantly more resistant than unalloyed titanium with respect to general and crevice attack. Data regression analysis suggests that molybdenum and vanadium impart a significant positive effect on alloy corrosion resistance under reducing acid chloride conditions, whereas aluminum is detrimental. Little effect of metallurgical condition (that is, annealed versus aged) on corrosion behavior of the higher molybdenum-containing alloys was noted. No obvious susceptibility to chloride and sulfide stress corrosion cracking (SCC) was detected utilizing U-bend specimens at 177°C.

16321 **Plasma plume effects in pulsed carbon dioxide laser spot welding.** Arnot, R.S.; Albright, C.E. (Joining Model Lab. Div., Sandia National Labs., Livermore, CA 94550). pp 51-58 of Proceedings of the materials processing symposium. Volume 38. Metzbower, E.A. Toledo, OH; Laser Institute of America (1983). (CONF-831195—). Contract AC04-76DP00789.

From International congress on applications of lasers and electro-optics; Los Angeles, CA, USA (14 Nov 1983).

The effect of pulsed carbon dioxide laser spot welding variables on plasma plume formation in argon and helium, and resulting spot weld characteristics in AISI 1015 steel have been investigated. Two penetration modes were found to occur. At high peak power densities, and with the focal point held at the target surface, a vapor cavity penetration mode was observed. This was associated with a blue plasma plume which absorbed laser energy. At low peak power densities, or with the focal point above the target surface, a heat conduction penetration mode was observed. This mode was associated with a red vapor plume which did not significantly absorb laser energy. Both plume types were larger in argon than in helium. In addition, in argon at higher power densities, the blue plasma plume associated with the vapor cavity penetration mode can decouple from the target surface preventing further heat input.

16322 **Porosity decrease in laser welds of stainless steel using plasma control.** Estill, W.B.; Formisano, B.D. (Joining Model Lab. Div., Sandia National Labs., Livermore, CA 94550). pp 67-72 of Proceedings of the materials processing symposium. Volume 38. Metzbower, E.A. Toledo, OH; Laser Institute of America (1983). (CONF-831195—). Contract AC04-76DP00789.

From International congress on applications of lasers and electro-optics; Los Angeles, CA, USA (14 Nov 1983).

High energy laser welding incorporating plasma control has been studied and reported by numerous investigators. These investigators demonstrated significant increases in laser weld penetration by use of plasma control. In this report the authors show, in addition to variations in weld penetration, drastic decrease in porosity and variation in weld bead shapes resulting from laser welds incorporating plasma control. In particular, deep laser welds (greater than 6 mm) have been produced in 304L stainless steel that show no root porosity and only very few, if any, detectable micropores.

16323 **Angle-resolved photoemission extended fine structure.** Barton, J.J.; Bahr, C.C.; Hussain, Z.; Robey, S.W.; Klebanoff, L.E.; Shirley, D.A. (Materials and Molecular Research Div., Lawrence Berkeley Lab., and Departments of Chemistry and Physics, Univ. of California, Berkeley, CA 94720). pp 82-88 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—).

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

Core level angle-resolved photoemission intensity oscillates sinusoidally with increasing photoelectron momentum. Interference between direct and scattered photo-emission causes this angle-resolved photoemission extended fine structure (ARPEFS). The authors discuss an analytic single-scattering theory which quantitatively describes the oscillations. The procedures for extracting surface geometry information from photoemission measurements are illustrated with S(1s) ARPEFS from S on Ni(100) and Cu(100) obtained with the soft x-ray double crystal monochromator at the Stanford Synchrotron Radiation Laboratory. Buildings on the surface sensitivity and chemical selectivity of photoemission, ARPEFS analysis provides direct geometrical information from the oscillation frequencies (derived with auto-regressive Fourier analysis), from intensity changes with polarization and analyzer position, and from analysis of scattering phase-shift zero-crossings.

16324 **Performance of multilayer dispersion elements from 80 to 500 eV.** Bartlett, R.J.; Kania, D.R.; Trela, W.J.; Kallne, E.; Lee, P.; Spiller, E. (Los Alamos National Lab., Los Alamos, NM 87545). pp 23-26 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—).

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

The authors have measured the reflectivity of several multilayer dispersion elements are measured between 80 and 500 eV. Two samples of ReW-C and one of Ni-C with 2d spacing of approximately 70 A and 150 A were tested at angles of incidence between 10° and 80°. Measurements were made by fixing the incident and reflected angles (Bragg) and scanning the photon energy. Theoretical analyses of these multilayers have also been made and the results are compared with the experimental measurements.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 15290, 15378, 15378, 15486, 15857, 15868, 16247, 16265, 16290, 16409, 16472, 16472, 17572, 17629, 17629

16325 **(CEA-CONF—8537) Irradiation damage in boron carbide: point defects, clusters and helium bubbles.** Stoto, T.; Zuppiroli, L. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 12p. (CONF-860608--9). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750464.

From World congress on high tech ceramics: electronic, engineering, nuclear, biomedical research and applications in focus; Milan, Italy (23 Jun 1986).

Boron carbide is a refractory hard and light material of interest in nuclear technology (fission and also fusion). Transmission electron microscopy was used to examine the properties of radi-

ation induced damage. Firstly, the production of point defects and their clustering was studied in samples irradiated by 1 MeV electron in a high voltage electron microscope at selected temperatures from 12 K to 1000 K. Secondly, conventional transmission electron microscopy was used to understand the production of helium bubbles in neutron irradiated boron carbide and their role in the generation of microcracks. Finally, the interaction between point defects and bubbles was also examined.

16326 **(CEA-CONF—8538) Irradiation damage in γ-$LiA10_2$.** Auvray-Gely, M.H.; Dunlop, A. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 10p. (CONF-860608—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750465.

From World congress on high tech ceramics: electronic, engineering, nuclear, biomedical research and applications in focus; Milan, Italy (23 Jun 1986).

Using EPR measurements at temperatures ranging from 30 K to 300 K, we studied the response of lithium aluminate single crystals to the irradiation with electrons in the MeV range at 20 K and with X-rays at room temperature. In the electron-irradiated γ-$LiA10_2$ sample, we observed three different paramagnetic defects - that were absent prior irradiation - whose EPR features are described here. Two of these defects were also present in the X-ray irradiated sample. The latter result proves that, in the γ-$LiA10_2$ sample, a photochemical mechanism exists, that is efficient in producing these two defects.

16327 **(CONF-860763—5) Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials.** Ackerman, J.L.; Ellingson, W.A.; Koutcher, J.A.; Rosen, B.R. (Argonne National Lab., IL (USA); Massachusetts General Hospital, Boston (USA). Radiology Dept.). Oct 1986. Contract W-31-109-ENG-38. 10p. NTIS MF A01; 2; GPO Dep. File Number DE87004987.

From Nondestructive characterization of materials; Montreal, Canada (21 Jul 1986).

The overall objective is to develop NMR methods for nondestructive evaluation in ceramics processing. This report describes preliminary research directed toward the use of NMR for nondestructively mapping porosity and internal voids in green-state bodies. Some future extensions of this work include the imaging of pore size distribution, and the imaging of binders, plasticizers and other components of the test sample. The investigators have shown it is possible to nondestructively image the internal volumes in a green-state ceramic body using filler fluids to provide NMR signal intensity. Features on the order of 300 μm can be detected in a field of view of 100 mm, and porosity may be imaged and measured as a fraction of maximum signal intensity. With improvements of the NMR apparatus specifically targeted to materials science applications, much higher resolution can be achieved: resolution approaching 10μm has recently been reported for very small biological samples. In addition to developing NMR probes optimized for ceramics processing development, we are proceeding to design experimental methods which employ cross-polarization techniques to image the organic phase directly. 18 refs., 4 figs.

16328 **(CONF-860968—4) Theory of the energetics and nonclassical nucleation for the tetragonal-monoclinic transformation of zirconia.** Chan, S.K. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004720.

From 3. international conference on the science of technology of zirconia; Tokyo, Japan (9 Sep 1986).

The energetics of the martensitic tetragonal-monoclinic transformation of zirconia are analyzed in terms of symmetry-adapted strains and elastic moduli. A nonclassical theory of nucleation is developed based on a solution of the time-dependent Ginzburg-Landau equation in conjunction with a Cahn-Hilliard type free energy functional for a shape-invariant diffused interface profile between the transformed and the parent phases. The critical radius of nucleation is derived as a function of temperature and applied stresses. The physical implications of the results towards both homogeneous and heterogeneous nucleations are discussed.

16329 **(CONF-861207—62) Theoretical studies of defects in binary and ternary oxides.** Ching, W.Y.; Ellis, D.E.; Lam, D.J. (Missouri Univ., Kansas City (USA). Dept. of Physics; Northwestern Univ., Evanston, IL (USA). Dept. of Physics). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004704.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

This paper presents some preliminary results of electronic structure of substitutional defects and vacancy in binary and ternary cubic zirconium oxides obtained by the embedded molecular-cluster model calculation. The importance of electronic charge redistribution in the solids where the defect is introduced into the perfect lattice is highlighted and the effect of electron polarization of the surrounding ions of the defect discussed.

16330 **(CONF-8310105—2) Erosion damage in glass and alumina.** Ritter, J.E.; Strzepa, P.; Jakus, K.; Rosenfeld, L.; Buckman, K.J. (Massachusetts Univ., Amherst (USA). Dept. of Mechanical Engineering). 14 Aug 1984. Contract AC02-81ER10950. 6p. American Ceramic Society. File Number TI87003342.

From Joint meeting of the Basic Science and Nuclear Divisions of the American Ceramic Society; Columbus, OH, USA (30 Oct 1983).

The effect of room-temperature erosion on material removal from and strength properties of soda-lime glass and sintered alumina was determined. The results were compared to the elastic/plastic indentation fracture model. The dependence of erosion rate and strength of soda-lime glass on the kinetic energy of the impacting particles was in good agreement with predictions. The lack of agreement between theory and experiment for sintered alumina was attributed to microstructural aspects of the erosion damage that are not modeled by indentation fracture.

16331 **(IAE—3999/4) Mathematical simulation of fuel materials swelling according to a quasistatic void model.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701283.

Technique and the algorithm solving the problem on fuel material swelling based on the quasistatic gas void model are given. Theories of plasticity and creep in increments are used for problem solving. The results of mathematical investigation of swelling in dispersed and single-component fuel are given, empirical dependences of fuel material swelling on burnup are concluded. 6 refs.; 6 figs.

16332 **(N—87-11892) Thermal barrier coating life prediction model development. Annual report.** Demasi, J.T. (Pratt and Whitney Aircraft, East Hartford, CT (USA)). Nov 1986. 213p. (NASA-CR—179508; NAS—1.26:179508; AR—2). NTIS, PC A10/MF A01.

A methodology is established to predict thermal barrier coating life in a environment similar to that experienced by gas turbine airfoils. Experiments were conducted to determine failure modes of the thermal barrier coating. Analytical studies were employed to derive a life prediction model. A review of experimental and flight service components as well as laboratory post evaluations indicates that the predominant mode of TBC failure involves thermomechanical spallation of the ceramic coating layer. This ceramic spallation involves the formation of a dominant crack in the ceramic coating parallel to and closely adjacent to the topologically complex metal ceramic interface. This mechanical failure mode clearly is influenced by thermal exposure effects as shown in experiments conducted to study thermal pre-exposure and thermal cycle-rate effects. The preliminary life prediction model developed focuses on the two major damage modes identified in the critical experiments tasks. The first of these involves a mechanical driving force, resulting from cyclic strains and stresses caused by thermally induced and externally imposed mechanical loads. The second is an environmental driving force based on experimental results, and is believed to be related to bond coat oxidation. It is also believed that the growth of this oxide scale influences the intensity of the mechanical driving force.

16333 **(N—87-12910) NDE reliability and process control for structural ceramics.** Baaklini, G.Y. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). 1986. 17p. (NASA-TM—88870; E—3276; NAS—1.15:88870; CONF-870505—2). NTIS, PC A02/MF A01.

From 32. international gas turbine conference and exhibition; Anaheim, CA, USA (31 May 1987).

The reliability of microfocus x-radiography and scanning laser acoustic microscopy for detecting microvoids in silicon nitride and silicon carbide was statistically evaluated. Materials- and process-related parameters that influenced the statistical findings in research samples are discussed. The use of conventional x-radiography in controlling and optimizing the processing and sintering of an Si_3N_4-SiO_2-Y_2O_3 composition designated NASA 6Y is described. Radiographic evaluation and guidance helped develop uniform high-density Si_3N_4 modulus-of-rupture bars with improved four-point flexural strength (857, 544, and 462 MPa at room temperature, 1200 C, and 1370 C, respectively) and reduced strength scatter.

16334 **(SAND—86-2126C) Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium.** Tallant, D.R.; Ward, K.J.; Bendow, B.; Poulain, M.; Poulain, M. (Sandia National Labs., Albuquerque, NM (USA); BDM Corp., Albuquerque, NM (USA); Rennes-1 Univ., 35 (France)). 1987. Contract AC04-76DP00789. 8p. (CONF-870138—1). NTIS, PC A02/MF A01. File Number DE87003789.

From 4. international symposium on halide glasses; Monterey, CA, USA (26 Jan 1987).

This paper reports a vibrational spectroscopic study of a series of glasses composed of Li-Ba-Th-Zr-fluoride in which Th^{4+} is progressively replaced by Zr^{4+}. In these glasses, Zr^{4+} shows a more pronounced variation in coordination number than previously observed. Distinct infrared reflectance and polarized Raman bonds due to Th^{4+} polyhedra are present only in the glasses containing less than 10 mole% ZrF_4. In the glasses containing 10 or more mole% ZrF_4, Raman and infrared bands due to Zr^{4+} polyhedra dominate the vibrational spectra, even in glasses where the ThF_4 concentration is greater than the ZrF_4 concentration. The difference in structural behavior or the Th^{4+} polyhedra as compared to the Zr^{4+} polyhedra is believed to be due to the smaller electric field intensity of the Th^{4+} and to the relatively restricted ability of Th^{4+} to vary its coordination number in response to the availability of F^{1-}.

16335 **Further aspects of the structure and magnetism of the layered compound Fe(III)ClMoO$_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies.** Torardi, C.C.; Reiff, W.M.; Lazar, K.; Zhang, J.H.; Cox, D.E. (E.I. du Pont de Nemours & Co., Wilmington, DE). *Journal of Solid State Chemistry;* **66**: No. 1, 105-115(Jan 1987). Contract AC02-76CH00016.

Aspects of the nuclear and magnetic structure of the three-dimensionally ordered state of the layered system Fe(III)ClMoO$_4$ are elucidated primarily on the basis of single crystal and powder Moessbauer spectroscopy and neutron powder diffraction refinements at various temperatures. The antiferromagnetically coupled spins and easy axis of magnetization for Fe(III)ClMoO$_4$ are indicated to lie in the tetragonal layers (ab planes) perpendicular to the c axis, which is parallel to the Fe-Cl bond vector of a local C/sub 4v/ FeO_4Cl chromophore. Additionally, the neutron diffraction data indicate a very significant c-axis contraction with decreasing temperature (2.7% between 295 and 5 K), with the rate of contraction being highest in the vicinity of the Neel temperature, T/sub N/ (~ 70 K). The structural changes that occur in the temperature range 300 to 5 K are discussed. Powder and single crystal magnetic susceptibility results to ~ 1.6 K as well as high field Moessbauer spectra to ~ 9 T are also presented. The latter indicate a spin flop transition with H/sub sf/ ~ 1 T. Alternate views of the low-dimensional magnetism of $FeClMoO_4$, evident as a broad maximum in its molar susceptibility at ~ 105 K, are discussed.

16336 **Mixed-mode fracture of ceramics.** Petrovic, J.J. (Los Alamos National Lab., Los Alamos NM). pp 127-136 of Fracture mechanics of ceramics: Vol. 8, Microstructure, methods, design, and fatigue. Bradt, R.C.; Evans, A.G.; Hasselman, D.P.H.; Lange, F.F. New York, NY; Plenum Press (1986). (CONF-8506128—).

From 4. international symposium on the fracture mechanics of ceramics; Blacksburg, VA, USA (18 Jun 1985).

The mixed-mode fracture behavior of ceramic materials is of importance for monolithic ceramics in order to predict the onset of fracture under generalized loading conditions and for ceramic composites to describe crack deflection toughening mechanisms. Experimental data on surface flaw mixed-mode fracture in various ceramics indicate that the flaw-plane normal stress at fracture decreases with increasing in-flawplane shear stress, although present data exhibit a fairly wide range in details of this σ - /tau/ relationship. Fracture from large cracks suggests that Mode II has a greater effect on Mode I fracture than Mode III. A comparison of surface flaw and large crack mixed-mode I-II fracture responses indicates that surface flaw behavior is influenced by shear resistance effects.

16337 **Transformation toughening in the $Al_2O_3Cr_2O_3$ / ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content.** Brog, T.K.; Tien, T.Y.; Wallace, J.S. (Univ. of Michigan, Ann Arbor, MI). pp 143-150 of Fracture mechanics of ceramics: Vol. 8, Microstructure, methods, design, and fatigue. Bradt, R.C.; Evans, A.G.; Hasselman, D.P.H.; Lauge, F.F. New York, NY; Plenum Press (1986). (CONF-8506128—).

From 4. international symposium on the fracture mechanics of ceramics; Blacksburg, VA, USA (18 Jun 1985).

The fracture toughness, strength, and modulus of AL_2O_3-Cr_2O_3 (matrix) /ZrO_2-HfO_2 (dispersed phase) composites were measured. The fracture toughness increased with increasing volume fraction dispersed phase whereas the strenght and modulus remained nearly constant up to 10v/o dispersed phase and then decreased for larger volume fractions. Multiple toughening mechanisms are apparently active in this system, with microcrack nucleation/growth dominating at high monoclinic contents.

16338 **Fracture mechanisms in lead zirconate titanate ceramics.** Freiman, S.W.; Chuck, L.; Mecholsky, J.J.; Shelleman, D.L. (National Bureau of Standards, Gaithersburg, MD). pp 175-186 of Fracture mechanics of ceramics: Vol. 8, Microstructure, methods, design, and fatigue. Bradt, R.C.; Evans, A.G.; Hasselman, D.P.H.; Lauge, F.F. New York, NY; Plenum Press (1986). (CONF-8506128—).

From 4. international symposium on the fracture mechanics of ceramics; Blacksburg, VA, USA (18 Jun 1985).

Lead Zirconate Titanate (PZT) ceramics can be formed over a wide range of $PbTiO_3$/$PbZrO_3$ ratios and exist in a number of crystal structures. This study involved the use of various fracture mechanics techniques to determine critical fracture toughness, K / SUB IC/ , as a function of composition, microstructure, temperature, and electrical and thermal history. The results of these experiments indicate that variations in K /SUB IC/ are related to phase transformations in the material as well as to other toughening mechanisms such as twinning and microcracking. In addition, the strength and fracture toughness of selected PZT ceramics were determined using specimens in which a crack was introduced by a Vicker's hardness indentor. The variation of K /SUB IC/ with composition and microstructure was related to the extent of twin-crack interaction. Comparison of the plot of strength as a function of indentation load with that predicted from indentation fracture models indicates the presence of internal stresses which contribute to failure. The magnitude of these internal stresses has been correlated with electrical properties of the ceramic. Fractographic analysis was used to determine the magnitude of internal stresses in specimens failing from "natural flaws."

16339 **Slow crack growth in sintered silicon nitride.** Khandelwal, P.K.; Chang, J.; Heitman, P.W. (Allison Gas Turbine Div., General Motors Co., Indianapolis, IN). pp 351-362 of Fracture mechanics of ceramics: Vol. 8, Microstructure, methods, design, and fatigue. Bradt, R.C.; Evans, A.G.; Hasselman, D.P.H.; Lauge, F.F. New York, NY; Plenum Press (1986). (CONF-8506128—).

From 4. international symposium on the fracture mechanics of ceramics; Blacksburg, VA, USA (18 Jun 1985).

The strength and crack growth characteristics of a sintered silicon nitride were studied at 1000 °C. Fractographic analysis of material failing in dynamic fatigue revealed the presence of slow crack growth (SCG) at stressing rates below 6 ksi/min. This material can sustain a 40 ksi flexural stress at 1000 °C for 400 hr or more but is susceptible to both slow crack growth and creep deformation at higher stress levels. The crack velocity exponent (N) determined both from dynamic and static fatigue experiments lies in a range from 13 to 22. The subcritical crack growth and creep behavior at 1000 °C is primarily controlled by the deformation of an intergranular glassy phase.

16340 **The elastic properties of LaNbO/sub 4/.** Nevitt, M.V.; Chan, S.K.; Grimsditch, M.H.; Fisher, E.S. (Materials Science and Technology Div., Argonne National Lab., Argonne, IL 60439). pp 391-396 of Materials characterization. Cheung, N.W.; Nicolet, M.A. Pittsburgh, PA; Materials Research Society (1986). (CONF-860445—). Contract W-31-109-ENG-38.

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

The measurement of single-crystal elastic properties is an important method of materials characterization. Elastic properties define intrinsically bulk behavior, but they also provide a microscopic insight into the dynamical behavior of the crystal lattice in relation to crystal structure and bonding. Moreover, they are particularly informative probes into the onset and the nature of a lattice instability and its role in inducing a phase transformation. On a macroscopic scale, stress-strain relationships, particularly those of an anisotropic kind, can be better understood and described in terms of the single-crystal elastic constants. The authors discuss the recent measurements on the elastic properties of a single crystal of LaNbO/sub 4/ to exemplify these points. This rather extensively studied double-cation oxide has a crystal structure in which isolated niobium-centered NbO/sub 4/ tetrahedra are linked by La ions.

16341 **Use of ion channeling axial scans in the study of ion-implanted Al_2O_3.** Farlow, G.C.; White, C.W.; Appleton, B.R.; Sklad, P.S.; McHargue, C.J. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **41**: 295-299(1985). Contract AC05-84OR21400.

Rutherford backscattering and ion channeling-axial scans have been used to study lattice sites for several impurities implanted into Al_2O_3. The case of Ga implanted in Al_2O_3 is discussed and is shown to be substitutional on the Al sublattice. Additionally, the use of this technique in the study of precipitates in Al_2O_3 is discussed with reference to Fe implanted Al_2O_3 which was annealed in either oxygen or hydrogen. 6 references, 4 figures.

16342 **Electronic structure of LaN; prediction of a small band overlap semi-metal.** Norman, M.R.; Jansen, H.J.F.; Koelling, D.D.; Freeman, A.J. (Argonne National Lab., IL). *Solid State Communications;* **52**: No. 8, 739-741(1984).

Results of a detailed theoretical investigation are reported which appear to resolve whether LaN is a semiconductor or a semi-metal. It is found that LaN has a band overlap of approximately 40 mRy making it a semi-metal. A detailed analysis of the physical approximations and of the numerical precision indicate that this result has an uncertainty of ~ 15 mRy which is too small to alter the conclusion. 14 references, 1 table.

16343 **Electrolytic coloration and electrical breakdown of MgO single crystals.** Abraham, M.M.; Boatner, L.A.; Christie, W.H.; Modine, F.A.; Negas, T.; Bunch, R.M.; Unruh, W.P. (Oak Ridge National Lab., TN). *Journal of Solid State Chemistry;* **51**: 1-16(1984). Contract W-7405-ENG-26.

A series of investigations of electrolytic coloration effects produced in MgO single crystals containing iron-group impurities has been carried out. The purpose of these investigations was to determine the identity and production mechanism of localized coloration or dark streaks that are frequently observed following the electrical breakdown of MgO crystals at temperatures in the range of 1000°C. A technique employing a point contact cathode was [illegible] to reproduce these coloration effects in a controlled systematic manner. Studies using a variety of techniques (MCD, EPR, SIMS, light scattering, etc.) establish the formation of metallic precipitates by electrolytic reduction of impurities is primarily responsible for the observed localized dark coloration effects. In situ observations of the coloration process showed that it was initiated at the cathode and that the regions of coloration are coincident with those regions of the MgO crystal where the catastrophic failure in electrical insulating properties occurs. Electrical breakdown and coloration effects were observed in MgO crystals doped with each member of the entire 3d transition series except scandium. Crystals doped with different impurities did vary, however, in their tendency to fail electrically. Similar solid state chemical alterations were induced by more conventional reduction techniques which generally required higher temperatures to produce metallic colloids than electrolysis. 20 references, 12 figures, 1 table.

16344 **Physical properties of oxide containing metal precipitates. Part II.** Narayan, J.; Chen, Y. (Oak Ridge National Lab., TN). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* **49**: No. 4, 475-492(1984). Contract W-7405-ENG-26.

The optical and mechanical properties of MgO single crystals containing coherent metal precipitates or colloids have been investigated. The optical absorption spectra of these materials were characterized by broad optical bands centered near 2.2 and 5. eV. By changing the size distribution of the precipitates, it was possible to obtain optical spectra of these materials suitable for solar selective absorber applications. Dislocations and sub-boundaries were found to provide nucleation sites for the formation of precipitates. The presence of these extended defects decreased the minimum temperature at which precipitates can be formed. The precipitates increased yield stress by a factor of about 4, and resulted in an increase in the room-temperature ductility of about 50%. Microstructures of deformed specimens revealed anchoring or pinning of mobile dislocations by precipitates as the probable cause for the increase in yield stress. The precipitates also enhanced ductility by providing dislocation sources, including punching out of dislocation loops. The coherent precipitates were found to transform into incoherent ones on deformation or laser irradiation. In situ fracture studies have shown the role of precipitates in preventing the propagation of cracks. By providing dislocation sources, the precipitates inhibit the propagation of cracks. 18 references, 10 figures, 1 table.

3606 Other Materials

REFER ALSO TO CITATION(S) 15408, 15446, 15605, 16247, 16279, 16317, 16330, 16398, 16469, 17340, 17352

16345 **(AD-A—173630/5/XAB) Heat capacities of rare gases adsorbed on graphite. Technical report.** Battaglia; Kim, Y.S.; George, T.F. (State Univ. of New York, Buffalo (USA). Dept. of Chemistry). Sep 1986. 23p. (UBUFFALO/DC—86/TR-14). NTIS, PC A02/MF A01.

The McQuistan-Hock model is used to investigate adsorption for realistic systems. After computing the partition function in the most convenient ensemble for the problem under consideration, i.e., the isothermal-isobaric ensemble, the heat capacity for submonolayer films of Ne, Ar and Xe on graphite is computed for several coverage values. Heat-capacity signatures exhibit maxima at temperature values that are in good agreement with experimental data.

16346 **(AD-A—174054/7/XAB) Damage assessment in composites by acoustic-ultrasonic technique. Final report, September 1985-August 1986.** Hahn, W.T. (Washington Univ., St. Louis, MO (USA)). Oct 1986. 3p. NTIS, PC A02/MF A01.

The damage development in cross-ply S-2 glass/epoxy laminates were assessed using acousto-ultrasonic (UA) and acoustic emission (AE) techniques. Acoustic-emission and acousto-ultrasonic measurements gave early warnings of damage initiation before transverse cracks became visible.

16347 **(ATR—86(8443)-1) Effects of hydrolysis on metallo-organic solution deposition of PZT [lead zirconate titanate] films.** Lipeles, R.A.; Coleman, D.J.; Leung, M.S. (Aerospace Corp., El Segundo, CA (USA). Chemistry and Physics Lab.). 30 Oct 1986. 17p. The Aerospace Corporation, El Segundo, CA 90245. File Number TI87900472.

The effects of hydrolysis on the degree of polymerization during metallo-organic solution deposition of lead zirconate titanate (PZT) films have been investigated. The reaction of lead 2-ethylhexanoate, zirconium n-tetrapropoxide, and titanium tetrabutoxide in isopropanol with water were studied using thermogravimetry, specular reflectance Fourier transform infrared spectroscopy (FTIR), and optical and electron microscopy. Films prepared from coating solutions having varying amounts of water exhibited dramatic differences in morphology. The films were spin-coated on platinum coated fused silica substrates and annealed at 525°C for 30 minutes. Unhydrolyzed coating solutions and solutions with a mole ratio of water to total metal of 0.5 yielded perovskite films with 0.5 to 5 μm grains. A mole ratio of 1.5 (the amount of water required to completely hydrolyze the metallo-organics in the solution) formed amorphous, porous films. The stability of the prepolymerized films inhibits crystallization and densification at moderate temperatures.

16348 **(BARC—1281) Development of optical thin film technology for lasers and synchrotron radiation.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701254.

Dielectric multilayer optical thin film devices play an important role not only in the working of lasers but also in different front line research activities using high power lasers and high intensity synchrotron radiation sources. Facilities are set up recently in the Spectroscopy Division to develop the optical thin film design and fabrication technologies indigeneously. Using the facilities thin film devices for different laser applications working in the wavelength range from 300 nm to 1064 nm were developed. Different technical aspects involved in the technology development are briefly described. 17 refs., 6 tables, 6 figures.

16349 **(CEA-CONF—8540) Hydrogen doping of silica by ion beam enhanced hydration.** Della Mea, G.; Mazzi, G.; Rossi-Alvarez, C.; Bezzon, G.; Chaumont, J.; Dran, J.C.; Mendenhall, M. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 17p. (CONF-8606101—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750467.

From 5. international conference on ion beam modification of materials; Catania, Italy (9 Jun 1986).

Correlative H-depth profiles by means of the resonant nuclear reaction $^{1}H(^{15}N,\alpha\gamma)^{12}C$ and refractive index measurements have been performed on ion implanted vitreous silica (approximately 1 keV/amu lead ions) subjected to leaching with water at 100°C. Thermal annealing experiments have been conducted both before and after water attack; they indicate that the ion-induced defects are very stable, as they are not completely annealed after heating at 900°C. Hydrogen is strongly trapped in the silica matrix, being only partially released by heating above 500°C. In addition, the refractive index which is enhanced by ion implantation is not significantly modified by post-implantation hydration; this feature argues for the stability with time in wet environments of the optical properties of ion beam processed optical fibers based on silica.

16350 **(CEA-CONF—8558) Relationship between leaching of trace elements (Cs, Sr and Co) and microstructure during aging of a mortar with a matrix of artificial Portland cement.** Lameille, J.M.; Chiappini, R.; Goutiere, G. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1986. 8p. (In French). (CONF-8609189—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750587.

From 8. international congress on cement chemistry; Rio de Janeiro, Brazil (22 Sep 1986).

Safety of storage of radioactive wastes solidified in cement matrix for more than 300 years requires the forecasting of radioactivity release variations. Release of Co-60, Sr-90 and Cs-137 by water leaching of a borated cement and evolution of microstructure are studied in this paper. Influence of boron on microstructure and on mechanical and physical properties of the matrix is not important at least for 2 years. But the variation of radioactivity release is very important for the same period. Cesium is trapped in mainly aluminous hydrates and slightly in hydrated calcium silicates and calcium oxides, strontium is trapped in sulfoaluminates and slightly in silicates and cobalt is trapped in the solid during hydration by formation of cobalt hydroxy chlorides.

16351 **(DOE/ER/45056—3) UV laser induced photochromic centers in cerium doped calcium fluoride.** Pogatshnik, G.J.; Hamilton, D.S. (Connecticut Univ., Storrs (USA)). Jan 1987. Contract FG02-84ER45056. 151p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE87005359.

The optical excitation of the lowest 4f to 5d transition in Ce^{3+}:CaF_2 by the 308 mm output of a Xe-Cl excimer laser results in strong coloration. The centers created were found to be divalent cerium ions at cubic sites. The system exhibits photochromic properties; the crystal can be returned to the original transparent state by illuminating it with light which is absorbed by the divalent cerium ions. The creation process for these photochromic centers involves a resonant two-photon transition from the 4f ground state of the cerium ion to the conduction band of the CaF_2 host. The lowest 5d level of the cerium ion serves as the real intermediate state for this transition. The photoionized electron can be trapped by another trivalent cerium ion at a site of cubic symmetry. These impurity sites with O/sub h/ symmetry result when the charge compensator associated with the rare earth ion is somewhat removed from the cerium ion site. The charge compensator is needed to maintain charge neutrality in the crystal when a trivalent rare earth is substituted for a Ca ion in the host lattice. The absence of a local charge compensator at a Ce^{3+} site with O/sub h/ symmetry, provides a net positive Coulombic potential, which aids in the trapping of electrons from the conduction band. The capture of an electron by a cerium ion at cubic site, changes the valence state of the ion to Ce^{2+} which accounts for the coloration of the crystal after illumination with uv laser light. A model for the production of the photochromic centers is presented.

16352 **(DOE/ER/45056—4) Ground and excited state photoconductivity measurements of Ce^{3+}:YAG.** Ghen, R.D.; Hamilton, D.S. (Connecticut Univ., Storrs (USA)). Jan 1987. Contract FG02-84ER45056. 34p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005358.

There does not seem to be any fundamental problem associated with using high intensity short duration pulsed laser sources for photoconductivity research. The observed photocurrent was linear with respect to both the applied electric field and the incident photon flux. No saturation effects of the photocurrent were observed at these applied electric fields and photon fluxes. The excited state photoconductivity experiment demonstrated the feasibility of such experiments as well as confirming that the strong excited state absorption transition in Ce^{3+}:YAG terminates in the YAG conduction band. The optical absorption from the 5d excited state led to an increase in the photocurrent which was due to an electron being promoted to the host conduction band.

16353 **(DOE/ER/45056—5) Energy transfer and nonlinear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987.** Hamilton, D.S. (Connecticut Univ., Storrs (USA)). Jan 1987. Contract FG02-84ER45056. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005355.

The project has considered several aspects of how high fluence, near ultraviolet laser light modifies the optical properties of cerium doped crystals. Illumination of Ce^{3+}:CaF_2 at 308 nm leads to a two-photon photoionization and the subsequent creation of photochromic color centers. A photoconductivity cell has been used to verify the two-step multi-photon ionization in Ce^{3+}:YAG and Ce^{3+}:CaF_2. Measurements of optical gain and loss in Ce^{3+}:$LiYF_4$ are presented. A microcomputer controlled thermoluminescence spectrometer has been built to determine electron trap

depths in rare-earth ion doped solids following their exposure to uv photoionizing light.

16354 **(DOE/ER/45116—18) Ab-initio determination of the structure of a grain boundary by simulated quenching.** Payne, M.C.; Bristowe, P.D.; Joannopoulos, J.D. (Massachusetts Inst. of Tech., Cambridge (USA)). Feb 1987. Contract FG02-84ER45116. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005362.

Results of the first completely ab-initio investigation of the microscopic structure of a grain boundary in a semiconductor are presented. Using the molecular dynamics simulated annealing method for performing total energy calculations within the local density functional and pseudopotential approximations, the $\Sigma = 5(001)$ twist boundary in germanium is studied. A number of rotation-and-translation states are investigated leading to a prediction for the structure of this geometry. Evidence for the possible presence of novel defects and glass-like tunneling mode states at grain boundaries is presented.

16355 **(DOE/ER/45258—1) The role of point defects on structural phase transitions: Progress report for the year 1986-1987.** Goldstein, J.I. (Lehigh Univ., Bethlehem, PA (USA)). 1987. Contract FG02-86ER45258. 10p. NTIS MF A01. File Number DE87004295.

Structural phase transitions were investigated in Li-doped $KZnF_3$ and $KMnF_3$ and in $K(Ta,Nb)O_3$. Ultrasonic method were used. (DLC)

16356 **(DP—1728) Long-term leaching behavior of simulated Savannah River Plant waste glass: Part 1, MCC-1 leachability results, four-year leaching data.** Wicks, G.G.; Stone, J.A.; Chandler, G.T.; Williams, S. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Aug 1986. Contract AC09-76SR00001. 107p. NTIS, PC A06. File Number DE87004515.

Long-term leaching data were obtained on SRP 131/TDS waste glass using MCC-1 or slightly modified MCC-1 standard leaching tests. Experiments were conducted out to four years at 40°C and 3-1/2 years at 90°C. These experiments have produced the longest standardized leaching data currently available in the waste management community. Long-term leaching data provide important input to modeling of waste glass behavior and ultimate prediction of waste glass performance. In this study, the leaching behavior of SRP waste glass was found to be excellent; leachates based on a variety of elements were not only very low, but also improved with increasing time. In addition to these data, results are also reported from another independent Savannah River study. Leaching behavior at 40°C and 90°C was assessed not only for a similar SRP 131 waste glass composition, but also for extreme waste glass compositions involving high-iron and high-aluminum waste. In addition, these experiments were performed using not only a standard deionized water leachant, but also simplified brine and silicate groundwater simulations. These two large data bases will be summarized and correlated along with some of the more interesting results recently reported in another study, a two-year leaching program performed on a similar SRP waste glass composition at Battelle Pacific Northwest Laboratories.

16357 (EPRI-CS—4918-Vol.3, pp 8.1-8.22) **Evaluation of acid-resistant synthetic needled felt filter media in coal-fired boiler pulse-jet baghouses.** Grubb, W.T. (W.W. Criswell Co., Riverton, NJ). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Glass fabrics, both woven and needled, have been the most widely utilized filter media for coal-fired boiler pulse-jet baghouses in the US. Although glass fabrics, aided by conservative design considerations, have performed adequately in many of these installations, their performance in many other units has been limited by their intrinsically poor abrasion resistance and inadequate resistance to acid conditions in cyclic boiler operations. Synthetic filter media possess abrasion resistance which is inherently superior to glass, but the use of synthetics has been limited by their lower temperature capabilities, acid resistance inferior to that of glass, or high initial cost. Recent developments such as Ryton (polyphenylene sulfide) fiber, acid resistant treatments for aramid (Nomex) felt, Rastex PTFE scrims, and modified aramid fiber are being evaluated in many boiler baghouses where glass fabric performance was inadequate. The results of several of these on-going trial installations are presented in this paper. 10 references, 3 figures, 10 tables.

16358 **(EUR—9772) EC static high-temperature leach test. Summary report of an European Community interlaboratory round robin.** Koennecke, R.; Kirsch, J. (Commission of the European Communities, Luxembourg). 1985. 267p. NTIS (US Sales Only), PC A12/MF A01. File Number DE87750550.

The results of an interlaboratory static high-temperature leach test conducted by the Commission of the European Communities in 1983 over a period of 9 months are compiled and statistically evaluated. A total of 12 laboratories - 10 from Member States of the EC and one from Finland and the USA - provided information concerning the test method and the analytical test results in the frame of a round robin test (RRT). All together these laboratories tested 366 waste from specimens of the borosilicate glass UK 209 containing simulated high-level radioactive waste. Leach tests were performed on the basis of the "Document on the EC static high-temperature leach test method" in autoclaves at leaching temperatures of 90°C, 110°C, 150°C, and 190°C over time periods of 3, 7, 14, 28 and 56 days using dionized water as leachant. The resulting leachates were analysed for the elemental concentrations of Si, B, Sr, Nd and Cs by all laboratories and for the concentrations of the optional elements Na, Al, Ce, Mo, Cr, Fe, Li, Mg and Zn by some of the participating laboratories. Additionally, the F content of the blank leachates was analysed by all laboratories.

16359 **(INPE—009-PRE/1001) Density of states due to pairing of impurities in semiconductor systems.** Deandradaesilva, E.A.; Dacunhalima, I.C.; Ferreiradasilva, A. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Oct 1986. 18p. NTIS, PC A02/MF A01.

The pair formation of hydrogen - like impurities in 3-D and 2-D systems is studied. The density of states is obtained for the ground state of the H_2 - like molecule and H_2+ - like ion for concentrations realizable in doped semiconductors and MOS structures. The joint density of states for the transition H_2 yields H_2+ is also obtained. The calculated bandwidth shows that pair formation is relevant in those systems.

16360 **(N—87-11893) Thermal conductivity of pristine and brominated P-100 fibers.** Hung, C.C.; Miller, J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 19p. (NASA-TM—88863; E—3263; NAS—1.15:88863; CONF-860333—2). NTIS, PC A02/MF A01.

From General meeting of the American Physical Society; Las Vegas, NV, USA (31 Mar 1986).

Thermal conductivity of brominated and pristine Union Carbide P-100 graphite fibers in the 30 to 160 C temperature range was determined by measuring thermal conductivities of graphite fiber epoxy composite samples and then excluding the epoxy contribution. A comparative thermal conductivity instrument was used to measure the thermal conductivity of the samples containing fibers. Results showed that the thermal conductivity values were 225 to 370 w/m-K and 215 to 340 w/m-K for pristine and brominated fibers, respectively. Furthermore, the thermal conductivity ratio of brominated to pristine P-100 fibers was 0.89, 0.91, and 0.92 at 55 to 80 C; 108 and 130 C, respectively. Such decrease in thermal conductivity results almost entirely from the 10 percent increase in fiber cross sectional area due to bromination. This result suggests that bromination effects on P-100 fiber structure is small, and that some structural changes, presumably the sharp-angled domain wall becomes less sharp, occurring in the 80 to 108 C temperature range.

16361 **(N—87-12356) Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986.** Bachmann, K.J. (North Carolina State Univ., Raleigh (USA)). Oct 1986. 28p. (NASA-CR—179884; NAS—1.26:179884). NTIS, PC A03/MF A01.

A research program on complex semiconducting compounds and alloys was completed that addressed the growth of single crystals of CdSe(y)Te(1-y), Zn(x)Cd(1-x)Te, Mn(x)Cd(1-x)Te, InP(y)As(1-y) and CuInSe2 and the measurement of fundamental physico-chemical properties characterizing the above materials. The purpose of this ground based research program was to lay the foundations for further research concerning the growth of complex ternary compound semiconductors in a microgravity environment.

16362 **(N—87-12679) Effects of graphitization on the environmental stability of brominated pitch-based fibers.** Gaier, J.R.; Slabe, M.E. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 13p. (NASA-TM—88899; E—3323; NAS—1.15:88899; CONF-861207—60). NTIS, PC A02/MF A01.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

The residual bromine graphite intercalation compounds of high modulus pitch-based fibers (Amoco P-55, P-75, P-100, and P-120) were formed and their resistances were monitored under a variety of environmental conditions. A threshold graphitization was observed below which the bromination reaction does not occur to an appreciable extent. The graphitization of the P-55 fibers falls below that threshold, precluding an extensive reaction. The P-75, P-100, and P-120 fibers all form bromination compounds which are stable at ambient conditions, under vacuum, and under high humidity (100 percent humidity at 60 C). The thermal stability of the resistivity increased with decreasing graphitization, with the stable temperature for P-120 being 100 C; for P-100, 200 C; and for P-75, 250 C. When cost is a consideration, bromination of pitch-based fibers is an economical way to achieve low resistivities.

16363 **(N—87-12680) Investigation of the effects of cobalt ions on epoxy properties.** Singh, J.J.; Stoakley, D.M. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Dec 1986. 16p. (NASA-TP—2639; L—16196; NAS—1.60:2639). NTIS, PC A02/MF A01.

The effects of Co(acac)sub x complexes on MY-720 epoxy properties have been investigated. It appears that some types of ions form antibonding or nonbonding orbitals which increase the free volume and also reduce the cohesiveness of the host epoxy, while others hand, seem to result in increased cohesiveness of the epoxy. The experimental values of magnetic moments of both types of ions in MY-720 suggest that the orbital momentum contributions of the (3d) electrons are partially conserved. The coordination environment of the cobalt ions in the host epoxy does not appear to be uniquely defined. These results indicate that the effects of metal ions on resin properties cannot be easily predicted on the basis of ligand field theory argument alone. Complex interactions between metal ions and host epoxy molecular structure suggest the desirability of parallel experimental investigations of electronic, magnetic, and mechanical properties of metal ion-containing epoxy samples for comparison with theory.

16364 **Transient enhanced diffusion and gettering of dopants in ion implanted silicon.** Pennycook, S.J.; Narayan, J.; Culbertson, R.J. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **36**: 151-156(1986). Contract AC05-84OR21400.

The authors have studied in detail the transient enhanced diffusion observed during furnace or rapid-thermal-annealing of ion-implanted Si. The authors show that the effect originates in the trapping of Si atoms by dopant atoms during implantation, which are retained during solid-phase epitaxial (SPE) growth but released by subsequent annealing to cause a transient dopant precipitation or profile broadening. The interstitials condense to form a band of dislocation loops located at the peak of the dopant profile, which may be distinct from the band formed at the original amorphous/crystalline interface. The band can develop into a network and effectively getter the dopant. They discuss the conditions under which the various effects may or may not be observed, and discuss preliminary observations on As^+ implanted Si. 12 references, 12 figures.

16365 **Effect of surface corrosion on glass fracture.** Bunker, B.C.; Michalske, T.A. (Sandia National Lab., Albuguergue, NM). pp 391-413 of Fracture mechanics of ceramics: Vol. 8, Microstructure, methods, design, and fatigue. Bradt, R.C.; Evans, A.G.; Hasselman, D.P.H.; Lauge, F.F. New York, NY; Plenum Press (1986). (CONF-8506128—).

From 4. international symposium on the fracture mechanics of ceramics; Blacksburg, VA, USA (18 Jun 1985).

The nature of aqueous corrosion reactions on glass surfaces varies with glass composition and environmental conditions. The authors show how the physical effects of the various surface reactions can be incorporated into simple fracture mechanics models to predict measured crack velocity effects in silicate glasses. The reactions on glass surfaces are divided into four categories: bond rupture reactions; alteration layer formation; surface deposition; and intermolecular surface forces. Results are demonstrated which show the effect of chemical reaction mechanisms on the long term mechanical behavior of glasses.

16366 **Ion beam channeling in superlattices.** Chu, W.K.; Allen, W.R.; Picraux, S.T.; Ellison, J.A. (Univ. of North Carolina, Dept. of Physics and Astronomy, Chapel Hill, NC 27514). pp 69-74 of Materials characterization. Cheung, N.W.; Nicolet, M.A. Pittsburgh, PA; Materials Research Society (1986). (CONF-860445—).

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

Ion beam channeling analysis has recently been applied to lattice strain measuarements on strained-layer superlattices (SLS). In this review talk, the authors outline three different methods of strain measurement: axial dechanneling, angular scans, and planar resonance. They describe the principles and illustrate them with examples; they also give a detailed theoretical treatment of the planar resonance effect in SLS's.

16367 **High temperature Raman studies of phase transitions in thin film dielectrics.** Exarhos, G.J. (Pacific Northwest Lab., Richland, WA). *Materials Research Society Symposia Proceedings;* **48**: 461-469(1985). Contract AC06-76RL01830.

Rapid and unambiguous characterization of crystalline phases in submicron sputter deposited TiO_2 films on silica substrates can be inferred from measured Raman spectra. Pure anatase and rutile, mixed phase, and amorphous films to thicknesses of several hundred Angstroms and greater yield Raman spectra exhibiting little interference from the substrate when the appropriate component of the scattered light is analyzed. In situ Raman spectra were acquired as a function of temperature to 900°C using conventional radiant heating techniques and to temperatures near 2000°C using 10.6^+ radiation from a CW CO_2 laser as a localized heating source. Pulsed Raman excitation/gated detection techniques were used to minimize blackbody radiation interference at these high temperatures. Anatase and amorphous TiO_2 films transform irreversibly to the rutile phase at temperatures below 900°C while rutile appears to be sable at much higher temperatures. Measurements performed on uncoated silica substrates at temperatures where the glass becomes fluid suggest that the strongly crosslinked glass has partially transformed into a chain-like structure. 12 references, 8 figures.

16368 **Time resolved studies of rapid solidification in highly undercooled molten silicon.** Lowndes, D.H.; Jellison, G.E. Jr.; Wood, R.F.; Pennycook, S.J.; Carpenter, R.W. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **35**: 101-106(1985). Contract AC05-84OR21400.

A KrF (248nm) pulsed laser was used to melt 90-, 190-, and 440nm thick amorphous silicon layers produced by Si ion implantation into (100) crystalline Si substrates. Time-resolved reflectivity measurements at two different probe wavelengths (633 nm and 1.15 μm) and post-irradiation TEM measurements were used to study the formation of an undercooled liquid Si phase and the subsequent solidification processes. The time-resolved measurements provide

new experimental information about the nucleation of fine-grained Si crystallites in undercooled liquid Si, at low laser energy densities (E/sub l/), and about the growth of large-grained Si in the near-surface region at higher E/sub l/. Measurements with the infrared probe beam reveal the presence of a buried, propagating liquid layer at low E/sub l/. Model calculations indicate that this liquid layer is generated in part by the release of latent heat associated with the nucleation and growth process. 8 references, 4 figures.

16369 **Time-resolved ellipsometry and reflectivity measurements of the optical properties of silicon during pulsed excimer laser irradiation.** Jellison, G.E. Jr.; Lowndes, D.H. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **35**: 113-118(1985). Contract AC05-84OR21400.

Several advances in time-resolved optical measurement techniques have been made, which allow a more detailed determination of the optical properties of silicon immediately before, during, and after pulsed laser irradiation. It is now possible to follow in detail the time-resolved reflectivity signal near the melting threshold; measurements indicate that melting occurs in a spatially inhomogeneous way. The use of time-resolved ellipsometry allowed the authors to accurately measure the optical properties of the high reflectivity (molten) phase, and of the hot, solid silicon before and after the laser pulse. They obtain $n = 3.8$, $k = 5.2$ (+/-0.1) at $\lambda = 632.8$ nm for the high reflectivity phase, in minor disagreement with the published values of Shvarev et al. for liquid silicon. Before and after the high reflectivity phase, the time-resolved ellipsometry measurements are entirely consistent with the known optical properties of crystalline silicon at temperatures up to its melting point. 10 references, 3 figures.

16370 **Modeling of undercooling, nucleation, and multiple phase front formation in pulsed-laser-melted amorphous silicon.** Wood, R.F.; Geist, G.A.; Solomon, A.D.; Lowndes, D.H.; Jellison, G.E. Jr. (Oak Ridge National Lab., TN). *Materials Research Society Symposia Proceedings;* **35**: 159-168(1985). Contract AC05-84OR21400.

Recently available experimental data indicate that the solidification of undercooled molten silicon prepared by pulsed laser melting of amorphous silicon is a complex process. Time-resolved reflectivity and electrical conductivity measurements provide information about near-surface melting and suggest the presence of buried molten layers. Transmission electron micrographs show the formation of both fine- and large-grained polycrystalline regions if the melt front does not penetrate through the amorphous layer. The authors have carried out extensive calculations using a newly developed computer program based on an enthalpy formulation of the heat conduction problem. The program provides the framework for a consistent treatment of the simultaneous formation of multiple states and phase-front propagation by allowing material in each finite-difference cell to melt, undercool, nucleate, and solidify under prescribed conditions. Calculations indicate possibilities for a wide variety of solidification behavior. The new model and selected results of calculations are discussed here and comparison with recent experimental data are made. 12 references, 7 figures.

16371 **Superlattice structures grown by molecular beam epitaxy.** Dawson, L.R. (Sandia National Labs., Albuquerque, NM). pp 377-382 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Strained-layer superlattices provide a wide range of tailorable electronic and optical properties, much of which cannot be achieved in lattice-matched alloys, or cannot be realized in mismatched alloys without the introduction of undesirable numbers of misfit defects. In some cases the strain can be used to achieve properties that cannot be achieved in any other manner. MBE has been used to prepare GaAs/In/sub .2/Ga/sub .8/As SLS material having high structural integrity, and excellent electrical, optical, and transport properties. Such materials have been incorporated into various device structures, including field effect transistors, photodetectors, and light emitting diodes with excellent initial results. The quality of the SLS material and its ability to exclude detrimental effects of misfit dislocations should allow its use in practical photovoltaic structures.

16372 **Amorphous materials and recrystallization.** Lucovsky, G.; Narayan, J. (North Carolina State Univ., Raleigh, NC 27650). pp 341-353 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

This paper deals with two materials science topics relevant to the utilization of semiconductors in energy systems. The first part of the paper focused on the local chemical bonding of alloy in a-Si and the second on the rapid recrystallization of ion-implanted and damaged semiconductor layers. Rapid crystallization methods based upon pulsed laser irradiation provide more efficient removal of ion implantation damage than conventional thermal annealing techniques. A "complete" electrical activation dopants and superior p-n junction properties are obtained by pulsed beam processing. The dopant concentrations far exceeding the equilibrium limits can be obtained, which may lead to novel advanced semiconductor devices. An example of application of pulsed beam processing in the fabrication of low-cost, high-efficiency solar cells is illustrated. The authors believe that the information provided in this paper will be useful and helpful to scientists and engineers who are primarily concerned with the fabrication, evaluation, and optimization of devices.

16373 **The surface electronic structure of GaAs(100) and GaAs(111) from angle resolved photoemission.** Bringans, R.D.; Bachrach, R.Z. (Stanford Synchrotron Radiation Lab., P.O. Box 4349, Stanford Univ., Stanford, CA 94305). pp 58-60 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—).

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

Angle resolved photoemission spectra have been measured for the polar (111) and (100) surfaces of GaAs. Strong differences exist in both cases between Ga-rich and As-rich surfaces in the energy region near the valence band maximum. Comparison of the spectra for the As-rich GaAs(111) (2x2) surface with a calculation of the location expected for bulk-derived features shows that the bulk bands appear to be folded back into the (2x2) surface Brillouin zone. No such effect is seen for the GaAs(100) c(4x4) surface.

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 15306, 15345, 15374, 15375, 15376, 15409, 16235, 16294, 16323, 16324, 16366, 16402, 16430, 16432, 16434, 16795, 16885

16374 **(BARC—1252) X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701248.

An XRF method for the determination of K, Rb and Cs in thoria has been developed using Philips PW-1220 semiautomatic X-ray spectrometer. Thoria samples are mixed with boric acid binder in proportion of 900 mg: 100 mg and the mixture is pressed over a boric acid backing pellet to form a double layer pellet. Tungsten target X-ray tube for excitation and LiF(200) crystal for dispersion have been used. The minimum determination limits of K, Rb and Cs are 100, 50 and 50 ppm respectively.

16375 **(BARC—1289) Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701256.

Sequential mass spectrometric analysis of uranium and plutonium employing anion exchange resin bead technique is reported

using a high sensitive single stage magnetic analyser instrument, the routinely employed rhenium double filament assembly and 0.5M HNO/sub 3/ as a wetting agent for loading the resin beads. A precision of better than 0.3per cent (2sigma) is obtained on the isotopic ratio measurements. However, extreme care has to be exercised to carry the resin bead experiments under ultra clean conditions so as to avoid pick up of contamination. 8 refs.

16376 **(BARC—1299) Semi-microdetermination of nitrogen in actinide compounds by Dumas method.** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701262.

This report describes the application of the Dumas method for the semi-micro determination of nitrogen in actinide compounds and actinide complexes with organic ligands. The usual set up has been modified to make it adaptable for glove box operations. The carbon dioxide generator and nitrometer assemblies were located outside the glove box while the reaction tube and combustion furnaces were housed inside. The nitrogen gas collected in the nitrometer was read with the help of a travelling microscope with a vernier attachment fitted in front of the nitrometer burette. The set up was standardised using acetanilide and employed for the determination of nirtogen in various substances such as uranium nitride, and a variety of substituted quinoline and pyrazolone derivatives of actinides as well as some ternary uranium-PMBR-sulphoxide complexes. Full details of the technique and the analytical data obtained are contained in this report. 9 refs., 7 tables.

16377 **(BARC—1300) Status of data and data needs for XRF and PIXE based element analysis.** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 25p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701263.

The status of data and data needs for X-ray fluorescence (XRF) and particle induced X-ray (PIXE) are examined to determine the areas where additional and improved data are required to improve the accuracy, precision and sensitivity of quantitative element analysis by the above techniques. 78 refs.

16378 **(BARC—1304) X-ray fluorescence analysis of thulium oxide/oxalate for rare earth impurities.** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701267.

An X-ray fluorescence spectrometric method for the analysis of thulium oxide is described. For the analysis, the sample in oxalate form is mixed with boric acid binding material and pressed into a pellet over a supporting pellet of boric acid. A wavelength dispersive Philips PW 1220 X-ray fluorescence spectrometer is used for the experiments; the minimum determination limits are 0.002 percent for Ho, Lu and Y, 0.005 percent for Dy and Er and 0.01 percent for Yb. Calculations for theoretical minimum detection limits and percent standard deviation at each concentration of the standard are carried out. 15 refs., 5 tables, 4 figures.

16379 **(BARC—1306) Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES).** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701269.

A method is described for the determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES). The method involves preconcentration of the four rare earth metals as fluorides in the presence of yttrium as carrier. During preconcentration, the maxtix Fe, is removed as soluble fluoride. The preconcentrated sample consisting of yttrium and microgramme quantities of the four rare earth metals, is ground with conducting graphite powder in the ratio 1:1 by weight. Standards have La, Ce and Nd in the concentration range 20-500 ppm and Pr in the range 50-500 ppm, are prepared using wet procedure. The spectra of samples and standards are recorded on a Jarrell-Ash 3.4 m Ebert plane grating spectrograph, with 30,000 l.p.i. grating in the wavelength region, 4200-4500 A, second order. Eight milligrammes each of sample and standard loaded in the cavity of a 1/4 U.C.C. graphite electrode are arced at 8 amp d.c. with an exposure time of 30 seconds. The relative standard deviation (RSD) ranges from +-7.4(La) to +-17.9per cent (Pr). 11 refs., 4 tables.

16380 **(BARC—1307) Spectrographic determination of boron in Mo-B microalloys.** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701270.

A spectrographic method is described for the determination of boron in Mo-B microalloys. Prior to spectrographic determination the sample is converted to oxide in presence of mannitol as complexing agent for boron. The oxide sample is ground with a mixture of ZnO and pure conducting graphite powder containing 10 percent NaF in the ratio 1:1:1 by weight. Standards containing boron in the range 10-500 ppm are also prepared by wet procedure. The spectra of samples and standards are recorded on a Hilger Large Quartz Spectrograph in the region 2400-3350 A. The line pair B 2496.8 A/Zn 2712.5 A is used for analytical calibration. The relative standard deviation (RSD) of the method is +-17.6per cent. 6 refs.

16381 **(BARC—1310) Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method.** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701271.

An x-ray fluorescence method for the determination of Ti, Cr, Cu and Ta in niobium oxide has been developed. Samples/standards in powder form are mixed with boric acid in the proportion of 1:1 (400 mg. each). Double layer pellets are prepared by pressing this mixture over a primary boric acid pellet. Philips PW-1220, a semiautomatic x-ray spectrometer with tungsten target x-ray tube for excitation and LiF (200) crystal for dispersion have been used. The determination range is from 0.005 to 0.1 percent for Ti and Cr, 0.01 to 0.1per cent for Cu and 0.05 to 1per cent for Ta. 6 tables.

16382 **(CNIC—00004) Proton exciting X ray analysis. A new technique of trace element analysis in biomedicine.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 13p. (In Chinese). (IAE—0004). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701274.

The analyzing capability of proton exciting X ray analysis for different elements in organisms was discussed, and dealing with examples of trace element analysis in the human body and animal organisms, such as blood serum, urine, and hair. The sensitivity, accuracy, and capability of multielement analysis were discussed. Its strong points for the trace element analysis in biomedicine were explained.

16383 **(CNIC—00008) Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 13p. (In Chinese). (IAE—0008). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701278.

The partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/ is described. A dissolving sample with electromagnetical mixer was designed. The oil bath of high boiling point was employed for dissolving sample. 30 mg PuO/sub 2/ could be dissolved completely about 20 minutes. The column partition chromagograph was used in which mixing extraction agent of TBP and TIOA (1:1) was employed as stationary phase, PTFCE powder as support, 3.5 N nitric acid as mobile phase. The determined trace elements were separated from 30 mg PuO/sub 2/ and collected in 1 ml receiving liquid. In which the low content of Pu did not interfere the determination. The indium was used as extra base, the indium and yttrium were used as inside marking elements. 29 trace elements (Cd, Ba, Be, Fe, Co, Si, B, Ga, Sc, P, Mn, Cr, W, Mg, Mo, Pb, Ni, Al, Ti, La, Ca, V, Ce, Cu, Ag, Zn, Li, Na, K) were determined cooperatively by ISP-28 type and ISP-51 type spectrograph using solution dry residue of high pressure spark. The range of the determination of the trace elements varies from 3 x 10/sup -6/ to 3 x 10/sup -2%. The recovery of this method varies from 83-120%. The precisio is within +-28%. The plutonium absorbed in the column can be desorbed by 4 N methanoic acid, for example, 30 mg PuO/sub 2/ can be desorbed quantitatively by 2 ml such desorbing agent.

16384 **(DOE/ER/13357—5) Laser light-scattering and laser fluorescence studies of solvent extraction systems.** Neuman, R.D. (Auburn Univ., AL (USA). Dept. of Chemical Engineering). 1986. Contract FG05-85ER13357. 8p. (CONF-860921—7). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003910.

From ISEC '86: international solvent extraction conference; Munich, F.R. Germany (11 Sep 1986).

The solvent extraction of metal ions from an aqueous solution to a nonpolar organic phase is a separation operation of major technological significance in the hydrometallurgical and nuclear industries. It is now recognized that the interrface plays a key role in the extraction process. However, the interfacial chemistry which occurs in the solvent extraction of metal ions is still very incompletely understood. Although investigations of the interfacial behavior of extraction reagents, in the past, have provided valuable information, progress is becoming more difficult in obtaining new fundamental information from classical surface-chemical approaches. The application of more sophisticated and recently developed techniques, such as laser techniques, holds promise for significant advances in understanding the molecular principles underlying the interfacial behavior of extractant molecules and thier interactions with metal ions. This paper will discuss recent advances in laser light-scattering and laser fluorescence techniques and their application to liquid/liquid interfacial systems.

16385 **(EUR—10026) Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems.** Birkhoff, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre; Commission of the European Communities, Luxembourg). Jun 1985. 451p. NTIS (US Sales Only), PC A20/MF A01. File Number DE87750542.

The basic information on the Pu content in Pu Contaminated Materials (PCM) is the measurement of radiation emitted by Pu isotopes either spontaneously or due to irradiation by external neutron or gamma-sources. Requirements on measurement accuracy and detection limits should be defined by the operator of a Pu-handling facility in accordance with monitoring objectives in the very beginning of the planning of a monitoring system. Monitoring objectives reflect nuclear safety and radiological protection regulations and the needs for Pu-accountancy of nuclear materials management and safeguards. On considering the possibilities and limitations of radiometric techniques a solution of the monitoring problem is based on appropriate segregation and packaging procedures and records upon matrix and isotopic composition of PCM-items to be measured. The general interrelations between waste item characteristics and measurement uncertainty and detection limit are outlined in the first chapter which is addressed to the system planner. Chapter 2 is devoted to the attention of instrument developers and analysts. It presents in a general approach the correlations between the observed radiation leakage rate, respectively detection signal, and the generating source, e.g. Pu-isotopic content of the examined PCM item. Some practical measurement methods are reviewed and their limitations are indicated. The possible radiometric techniques based on detection of gamma rays from alpha decay (and ^{241}Am), neutrons from spontaneous fission and (α,n)-reaction and from induced fission reactions by neutron irradiation of Pu isotopes are presented. The measurement uncertainty of a single PCM item measurement is estimated on the basis of the uncertainty of the spatial distributions of source (Pu) and matrix materials. For the estimation of the cumulative error over a large collection of PCM items from a defined PCM-stream a probabilistic approach is suggested.

16386 **(EUR—10189) Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$.** Berthelot, C.; Eschbach, H.L.; Verdingh, V.; Herrmann, S. (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements; Commission of the European Communities, Luxembourg). 1986. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750549.

Reference materials of natural and isotopically enriched or depleted Li_2SO_4 are used for neutron cross section measurements. The detection limits of Sm, Eu, Gd, Dy and Cd in Li_2SO_4 by atomic emission spectroscopy (AES) and instrumental photon activation (IPA), correspond to a total contribution equivalent to the natural lithium (σ=70.5 barns), of 0.160% and 0.0213% respectively. $MnSO_4$ solutions are used for the calibration of neutron sources, e.g. ^{252}Cf. The direct analysis of Sm, Eu, Gd, Dy, and Cd in $MnSO_4$ by AES and IPA, provides detection limits from which the total contributions equivalent to the manganese (σ=13.3 b) are respectively 2.38% and 0.395%. In order to improve the detection limits of Rare Earths, a method had been developed for the R.E/Mn chemical separation which is based on the coprecipitation of Rare Earths as fluorides by HF in the presence of ammonium after the addition of very pure Y as a carrier. A solution of sup(152 + 154)Eu(1.11 x 10^5Bq) is used to monitor the recovery of the lanthanides. The Sc and Y are determined directly by AES or IPA. As an example, the contributions of Sm, Eu, Gd and Dy obtained by AES after the chemical separation of a solution containing 300 mg $MnSO_4$ per gram, are reduced to 0.0114%. The concentration of Cd found in this solution is 3.7 μg/g $MnSO_4$ and the total contribution of the 16 Rare Earths and Cd is <=0.107%.

16387 **(EUR—10441) Measurements of transuranium trace amounts in solution. Bibliographic study.** Billon, A.; Gaudez, M.T. (Commission of the European Communities, Luxembourg). 1986. 150p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE87750544.

A critical study based on the data of the literature published up to 1984 has been carried out on the measurements of transuranium traces in solution. The general technical aspects of the dosage of transuranium traces in solution and of their speciations were initially reviewed. The second part is devoted to the detailed review of various methods in use in the laboratories. This work has been carried out in the framework of the MIRAGE (migration of radionuclides in the biosphere) Community project. 85 refs.

16388 **(EUR—10445) Laser Induced Photoacoustic Spectroscopy for the oxidation specific determination of actinoids in solution.** Stumpe, R.; Kim, J.I. (Commission of the European Communities, Luxembourg). 1986. 63p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87750551.

A laser induced photoacoustic spectroscopy (LPAS) is developed for the microscopic speciation of actinoids in natural aqueous solution. By introducing special detection instrumentation and signal processing system, a differential measurement of sample and reference solutions is realized. The LPAS provides a normal spectral work comparable to conventional absorption spectroscopy, only with the higher speciation sensitivity, e.g. 10^{-8} mol L^{-1} for the Am(III) ion. Applications of the LPAS are demonstrated for the speciation of oxidation state, hydrolysis reaction, complexation and colloid generation of actinoid ions in micro or submicromole range in pure solutions as well as natural groundwaters. 33 refs.

16389 **(EUR—10503) ^{235}Uranium isotope abundance certified reference material for gamma spectrometry EC nuclear reference material 171 certification report.** De Bievre, P.; Eschbach, H.L.; Lesser, R.; Meyer, H.; Audenhove, Van J.; Carpenter, B.S. (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements; Commission of the European Communities, Luxembourg). 1986. 108p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87750541.

This certification report contains the information necessary for the final certification of EC nuclear reference material 171. It is also intended to inform the user of the reference material concerned on technical/scientific details which are not given in the certificate. The report describes the reference material which consists of sets of U_3O_8 samples with five different ^{235}U/U abundances, filled in cylindrical aluminium cans. The can bottom serves as window for emitted gamma radiation. The report describes how the ^{235}U/U abundances were characterized, how the other properties relevant for gamma measurements were determined and gives all connected results as well as those from the verification measurements. Appendix A represents the draft certificate. 32 refs.

16390 **(Juel-Conf—55) Analysis of materials (metals, ceramics, minerals) using spectroscopic methods.** Rottmann, J. (comp.). (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Jan 1986. 160p. (CONF-8509177—). NTIS (US Sales Only), MF A01. File Number DE87751308.

From 24. colloquium spectroscopicum internationale; Garmisch-Partenkirchen, F.R. Germany (23 Sep 1985).

This report comprises a collection of all but one of the contributions made by the participants in the Post CSI Symposium. In the first part of this Symposium, KFA staff presented a survey of analysis and special spectroscopic investigations being carried out in the KFA. Several participants prepared presentations concerning their own spectroscopy activities. The contributions dealt partly with the development and advances in different spectroscopic techniques used in recent years in the iron and steel industry and in the investigations of graphitic, ceramic and geological materials. Of particular interest are the ICP methods and trace element analysis. In some of the presentations, various spectroscopic methods for analysis were applied and compared. One contribution dealt specifically with the preparations of specimens of materials that are difficult to dissolve. High temperature mass spectrometry was of special interest. The services offered by the Chemical Analysis Department (ZCH) of the KFA were presented; a variety of spectroscopic techniques for chemical analysis of materials was outlined in this contribution.

16391 **(KFK—4019) Application of different methods of neutron activation analysis to the determination of trace elements in rock samples.** Zaghloul, R.; Gantner, E.; Mostafa, M.; Ache, H.J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie). Jun 1986. 71p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87750525.

In this report three different methods of neutron activation analysis applied to the determination of up to 20 trace elements in Egyptian rock samples and the results obtained are discussed. In Part I a physical approach is described for instrumental multielement activation analysis with whole neutron spectrum (without Cd-cover) using the monostandard (single comparator) method. 15 Samples representing different Egyptian granite rocks were analyzed. As many as 21 trace elements beside Fe, K and Na were determined. The accuracy of the method for nondestructive multielement analysis agrees within 3% with the relative method using multielement standards. In Part II a method is described for epithermal neutron activation analysis of 20 elements in granite rock samples using only one standard. Gold has been used as a single comparator due to its relatively high resonance integral value (I/sub o/ = 400) and in addition, it is preferable on Co in order to obtain a large epithermal activation in a short irradiation. The method of calculation is simple and rapid and can be done using small calculator. In Part III experiments are described in which a neutron capture gamma-ray spectroscopy facility assembled at the Institute of Radiochemistry, KfK (for analytical purposes) using Cf/sup 252/ neutron source of strength propor to 6 x 10/sup 7/ n/sec, has been used to check its applicability and sensitivity for quantitative analyses of ores. The analysis of Sm, Gd and Mn in phosphate and monazite rock samples has been carried out. The results from this study show a variation of about 25% from the values determined by RNAA method. The reasons for this discrepancy are discussed and suggestions are made to optimize the conditions of measurement and irradiation.

16392 (PNL—5500-Pt.4, pp 9) **Technology transfer of kinetic phosphorimetry.** Whitaker, T.J.; Bushaw, B.A. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Kinetic phosphorimetry, described in the 1982 annual report, has been the subject of a PNL technology transfer program. This technique provides rapid, accurate analyses for low concentrations of uranium in aqueous solution. It has several applications including bioassays, field assays for prospecting, and environmental monitoring. A prototype instrument based on this technology was displayed at the Twenty-ninth Annual Conference of Bioassay, Analytical and Environmental Chemistry in October 1983. A technical presentation was given at this and at other professional meetings, and direct communication was established with several instrument manufacturers. As a result of this program, two commercial companies plan to market an instrument based on kinetic phosphorimetry.

16393 (PNL—5500-Pt.4, pp 9-10) **Continuous wave double-resonance ionization and laser-enhanced electron impact ionization.** Whitaker, T.J.; Cannon, B.D.; Bushaw, B.A. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Resonance ionization spectroscopy (RIS) is recognized as an extremely sensitive analytical technique, but practically all experiments to date have been performed with pulsed lasers. Continuous wave (cw) lasers offer the advantage of narrow bandwidths for isotopic selectivity and an improvement of 10^4 to 10^5 in duty cycle. The authors are developing a technique that uses cw dye lasers to excite an atom to a high electronic state by sequential excitation through a resonant intermediate state or by a resonantly enhanced two-photon process. The excited atom is then ionized by a high-power cw infrared laser. Initial experiments have been performed on an effusive atomic beam of barium generated from an oven at temperatures up to 600°C. Counter-propagating dye laser beams (5 to 10 mW) and the beam from a cw Nd:YAG laser (up to 100 watts) intersect the atomic beam at right angles in the ionizing region of a quadrupole mass spectrometer. The relative ion yield of ^{137}Ba to ^{138}Ba is about 130.

16394 (PNL—5500-Pt.4, pp 10) **Laser analysis of directly injected supercritical fluids.** Cannon, B.D.; Udseth, H.R.; Whitaker, T.J.; Smith, R.D. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

This method of direct injection of supercritical fluids, described in the 1983 annual report is being investigated as a source of vapor phase molecules that may be proved by laser-induced fluorescence or resonance ionization mass spectrometry. This will allow normally low-volatility compounds, such as polynuclear aromatic hydrocarbons, to be introduced into a vacuum system as intact, vapor-phase molecules which may be analyzed by sensitive laser techniques. An added benefit of the direct injection process is the internal cooling that occurs in the molecule, an effect that produces sharp spectral features, and thus, better selectivity in laser analysis. Equipment is currently being assembled for initial experiments on this promising new technique.

16395 **(WAPD-T—2873) On-line ion chromatography system.** Lynch, G.J. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Jun 1986. Contract AC11-76PN00014. 17p. (CONF-870316—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87000912.

From 38. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy; Atlantic City, NJ, USA (9 Mar 1987).

A benchtop Dionex Series 2000i ion chromatography system has been modified and installed on-line to automatically perform production sampling and analysis of five high temperature and high pressure laboratory autoclave test systems. An HP-9816 microcomputer-controller for the ion chromatography system also controls the sampling and ensures that all systems are synchronized. This is a unique application of a system that heretofore has been used exclusively for benchtop laboratory work.

16396 **High efficiency direct detection of ions from resonance ionization of sputtered atoms.** Gruen, D.M.; Pellin, M.J.; Young, C.E. (to Dept. of Energy, Washington, DC). US Patent 4,633,084. 30 Dec 1986. Filed date 16 Jan 1985. vp.

A method is described for the quantitative analysis of a component in a sample comprising the steps of: bombarding the sample with a beam of energetic particles or photons to produce ion and neutral atom groups emanating in a direction away from the sample, selectively accelerating the ions in the ion group emanating from the sample for separation from the neutral atom group, directing one or more laser energy pulses at the neutral atom group to convert the neutral atoms to ions by laser initiated resonance ioni-

zation spectroscopy, causing the ionized neutral atoms to be selectively deflected with respect to the emanating ions to form a deflected beam of ionized neutral atoms, and detecting the ionized neutral atoms in the deflected beam as a measure of the quantity of the component in the sample.

16397 **Micro-tomography using synchrotron radiation.** Johnson, Q.C.; Kinney, J.H.; Bonse, U.; Nichols, M.C.; Nusshardt, R.; Brase, J.M. (Lawrence Livermore National Lab., Livermore, CA 94550). pp 203-208 of Materials characterization. Cheung, N.W.; Nicolet, M.A. Pittsburgh, PA; Materials Research Society (1986). (CONF-860445—).

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

This paper discusses the results of recent experiments at Stanford Synchrotron Radiation Laboratory (SSRL) and Hamburger Synchrotronstrahlungslabor (HASYLAB) which were designed to explore the feasibility of using synchrotron radiation in high-resolution, computerized, critical-absorption tomography. The results demonstrate that it is possible, using absorption-edge differencing, to identify adjacent elements in the periodic table with high sensitivity. Furthermore, by using the fine structure in the absorption spectra, it is possible to distinguish between regions of different chemical states. Methods of using synchrotron radiation for high-resolution, three-dimensional chemical-state mapping in small samples are discussed.

16398 **Spatially-resolved non-contact methods for the investigation of transport and defects in semiconductors.** Amer, N.M. (Applied Physics and Laser Spectroscopy Group, Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). pp 51-58 of Materials characterization. Cheung, N.W.; Nicolet, M.A. Pittsburgh, PA; Materials Research Society (1986). (CONF-860445—).

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

Photothermal spectroscopy employs the small rise in temperature associated with the absorption of electromagnetic radiation to probe optical and transport properties of materials. A review of the various photothermal detection schemes is given, and examples which illustrate the power of this technique are reviewed.

4002 Inorganic, Organic And Physical Chemistry

REFER ALSO TO CITATION(S) 15301, 15302, 15304, 15308, 16282, 16300, 16334, 16435, 16813, 17357

16399 **(BARC—1302) Water Chemistry Division Progress Report, April 1983-April 1985.** Momin, A.C.; Rao, U.R.K.; Venkateswaran, G. (eds.). (Bhabha Atomic Research Centre, Bombay (India)). 1986. 86p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87701265.

The research and development work of the Water Chemistry Division during the period from April 1983 to April 1985 is reported in the form of individual summaries. The activities of the Division cover the following fields: water and steam chemistry, high temperature studies, single crystal structure by x-ray diffraction, vriable temperature, x-ray powder studies, thermal analysis and thermophysical properties of rare earth compounds and uranium chemistry.

16400 **(CEA-CONF—8519) Multiphoton dissociation of UF6 at lambda = 16 μm in supersonic jets.** Gilbert, M.; Weulersse, J.M.; Isnard, P.; Salvetat, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 16p. (CONF-860620—11). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750472.

From Society of Photo-Optical Instrumentation Engineers international symposium: topics in optical and optoelectronic applied sciences and engineering; Quebec City, Canada (2 Jun 1986).

The multiple photon excitation of UF6 at 16μm has been studied in a number of laboratories, in view of its potential applications in uranium enrichment, using various schemes. Results are reported on two-frequency multiphoton dissociation of UF6 cooled at 90K in a supersonic expansion of Ar as the carrier gas, using a Raman source pumped by two TEA line-tunable CO2 lasers. Additional data were obtained on multiphoton absorption of UF6 at low and room temperatures, and on vibrational relaxation of UF6. 15 refs.

16401 **(CONF-8610159—2) Gas-phase chemical reactions of transition metal clusters with simple molecules.** Riley, S.J.; Parks, E.K. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004935.

From International symposium on the physics and chemistry of small clusters; Richmond, VA, USA (28 Oct 1986).

Chemical reactions of isolated transition metal clusters are studied in a laser-vaporization cluster source coupled to a continuous-flow reactor. Detection of reaction products is via laser ionization and time-of-flight mass spectrometry. Experimental probes that have been developed include: (1) kinetics measurements, in which the disappearance of bare cluster signal with increasing reagent gas flow is used to determine absolute reaction rate constants for the addition of the first adsorbate molecule; (2) product composition measurements, in which inferences as to cluster structure and the nature of surface binding sites are derived by determining the total number of adsorbates the clusters can accommodate; (3) laser-induced desorption experiments, from which adsorbate binding energies can be derived; and (4) the observation of actual chemical reactions on cluster surfaces, such as hydrogen/deuterium exchange or adsorbate photochemistry. In addition, a new experimental procedure has been developed that, in a single series of measurements, provides measures of the first three parameters listed above. A review is given of earlier studies of the reaction of iron clusters with hydrogen. More recent results on the reaction of iron clusters with ammonia, and the reaction of ammoniated iron clusters with hydrogen, are also presented.

16402 **(DOE/ER/45107—2) Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986.** Burkhart, R.D. (Nevada Univ., Reno (USA)). 1986. Contract FG08-84ER45107. 23p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003822.

An integrated system has been constructed to conduct experiments on time resolved photoluminescence processes into the low microsecond time regime. It is specifically designed for investigations of triplet photophysical processes in polymers and it is very sensitive providing, for the first time, triplet-triplet absorption spectra of poly(N-vinylcarbazole). A primary mission for this system is the direct detection of excited triplets using triplet-triplet absorption spectroscopy. Both spectroscopic and kinetic characteristics of polymeric triplet states have been investigated with this system. Quantitative measurements have been made of molar absorptivities, triplet quantum yields and specific rate constants for both radiative and radiationless transitions for poly[4-((vinyloxy) carbonyl)-carbazole] (PFCZ) and ot its monomeric analogue (MFCZ). In addition, specific rate constants for triplet-triplet annihilation have been evaluated for several polymers and molecularly doped polymeric systems. Additional studies include computer assisted resolution of the excimeric phosphorescence of poly(N-vinylcarbazole) and the synthesis of end-capped polystyrene molecules in order to investigate intramolecular exciton transfer. Work is also under way to determine contributions from intermolecular and intramolecular triplet exciton migration in very concentrated solutions of poly(2-vinylnaphthalene). 6 refs., 3 figs.

16403 **(DOE/PC/80536—T5) A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987.** Murty, A.N. (Grambling State Univ., LA (USA). Dept. of Physics). 10 Feb 1987. Contract FG22-85PC80536. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005608.

This report describes the results of our studies during the last quarter. One major objective of our investigation is to examine the effect on the NMR Spectrum of cobalt due to the method of impregnation of cobalt into the lattice of the medium pore zeolite ZSM-5. We have completed a comprehensive study of the physical-

ly admixed Co/Co-ThO_2 and ZSM-5 catalysts and the results are being published in the April issue of Journal of Applied Physics. The results of our studies on aqueously impregnated samples have been reported in the 4th quarterly technical progress report. This report presents the data on the acetone impregnated catalysts. A preliminary survey on a series of twelve acetone impregnated catalyst samples of Co-ZSM-5 and Co-ThO_2-ZSM5 has been carried out. The zero-field NMR spectra have been examined and analyzed for the two catalytic stages, before and after use, with and without thoria for three different metal loadings of cobalt (3%, 6%, and 9% by weight) in ZSM-5. 7 refs., 2 figs., 1 tab.

16404 **(KFK—3930-UF) Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid.** Eberle, S.H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie). Jun 1986. 142p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE87750864.

The theoretical background is given for considering the presence of complexes and other weak acids than carbonic acid in calculating carbonic acid equilibria in water chemistry. A computer programm WASA2T is described, in which the species mentioned are implemented. It allows the calculation of the m-value and total carbonate from one or two titrations of the water (alkalinity and acidity). Furthermore the calculation of the calcit saturation pH, of theoretical titration curves and of the pH for equilibrium with a gas atmosphere of known CO/sub 2/ partial pressure respectively is possible. Comparison of the calculated pH with experiments has shown an agreement better than $\Delta pH < 0.03$ as a mean value.

16405 **(NP—7770050) Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas.** Heinze, V. (Paderborn Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich 13 - Chemie und Chemietechnik). 10 Jan 1986. 109p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE87770050.

Boron-containing zeolites of the medium-pored pentasil type and the close-pored erionite-offretite type were synthesized, and the reaction conditions were optimized with regard to reaction times and product crystallinity. For example, the use of seed crystals resulted in a reduction of the crystallisation time from 120 to 60 h in the pentasil type. Pyrogenic silica gel can be substituted by silicate of sodium as a SiO/sub 2/ source. Substitution of organic ammonium compounds by less expensive substrates like alcohols or acetone can be recommended only for tert. butanol. The erionite-offretite-type zeolite, which has high boron and silicon concentrations, was synthesized for the first time and identified by IR spectroscopy and by Guinier radiography. The reaction mechanism of methanol or DME conversion was investigated. Modified Fischer-Tropsch synthesis experiments showed that the highest C/sub 2/-C/sub 4/ olefin selectivity was obtained with the iron-doped zeolite type A as catalyst (T=270 to 310/sup 0/C; p=1.5 to 2.2 MPa).

16406 **(NTB—85-22) Some considerations concerning the thermodynamics and kinetics of the reaction between iron and water in bentonite.** Heusler, K.E. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). Jun 1985. 23p. (In German). Nagra, Ch-5401 Baden, Switzerland.

The report presents the thermodynamic relations and equations for the equilibrium potential of an iron saturated magnetite electrode, the equilibrium hydrogen partial pressure and the solubility product of magnetite as a function of system temperature and pressure; the values of these functions are calculated from the known standard enthalpies, specific heats and molar volumes. For temperatures between 300 K and 600 K and for pressures up to 400 bar the most probable values of the hydrogen partial pressure is close to 1 kbar and the activity of divalent iron in equilibrium with magnetite is of the order of a few μM. The pH value corresponding to the equilibrium solubility in pure water is close to that of water in bentonite. It should be borne in mind that, in view of the uncertainties on the thermodynamic data upon which the calculations are based, the results can only be considered as orders of magnitude. The corrosion behaviour of iron in bentonite is discussed next. The corrosion rate is essentially determined by the parabolic growth of an oxide layer. Over a period of time of up to few years the corrosion rate should fall below 0.1 μm a/sup -1/, even at 150 C. Assuming this rate as stationary, it is shown that the equilibrium partial pressure of hydrogen cannot exceed some 60 bar. For these estimates the data used, especially as regards diffusion geometry, are those of current Nagra feasibility projects. For instationary conditions as well, partial pressures of only a few bar should be expected, although the corrosion rates are higher. At hydrostatic pressures of 100 bar or more gaseous hydrogen evolution cannot take place due to the kinetics of the process.

16407 **(ORNL/TM—9998) Viscosity behavior in supercooled pure liquids and mixtures.** Hughes, J.A.; Byers, C.H. (Oak Ridge National Lab., TN (USA)). Dec 1986. 55p. NTIS, PC A04/MF A01. File Number DE87004036.

Under relatively quiescent conditions, it is often possible to maintain fluids in a liquid state at temperatures below their freezing point. Viscosities of phenol and t-butanol in the freezing-point region deviate significantly from the Andrade correlation. Two Andrade curves, one above and one below the freezing point, cross at approximately the freezing point and fit the data well. An Antoine-type relationship fits all the phenol data well, but two such curves are required to fit the t-butanol data. The activation energy term in the Andrade equation increases significantly when the temperature drops below the freezing point. This may be interpreted as being the result of luster formation in the liquid, or at least the establishment of more short-range order in the supercooled fluid. Mixtures containing up to 1 mol % ethanol in t-butanol behaved, from a viscosity viewpoint, in a manner similar to pure t-butanol, that is, the viscosity relationship changed at the freezing point of the pure fluid and not at the freezing point of the mixture. The time dependence of the supercooled viscosity of the pure fluids was explored. 25 refs., 14 figs., 2 tabs.

16408 **(ORNL/TM—10324) Stable isotope customer list and summary of shipments, FY 1986.** Tracy, J.G. (comp.). (Oak Ridge National Lab., TN (USA)). Feb 1987. Contract AC05-84OR21400. 32p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005294.

This compilation is published as an aid to those concerned with the separation and sale of stable isotopes. The information is divided into four sections: alphabetical list of domestic and foreign customers, showing the stable isotopes purchased during the fiscal year; alphabetical list of isotopes, cross-referenced to customer numbers and divided into domestic and foreign categories; alphabetical list of states and countries, cross-referenced to customer numbers and indicating geographical concentrations of isotope users; and tabulation of the shipments, quantities, and dollars for domestic, foreign, and project categories for each isotope.

16409 **Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation.** Chamberlain, L.R.; Durfee, L.D.; Fanwick, P.E.; Kobriger, L.; Latesky, S.L.; McMullen, A.K.; Rothwell, I.P.; Folting, K.; Huffman, J.C.; Streib, W.E.; Wang, R. (Purdue Univ., West Lafayette, IN). *Journal of the American Chemical Society;* **109**: No. 2, 390-402(21 Jan 1987). Contract FG22-85PC80909.

The authors wish to report here a combination of synthetic, spectroscopic, and structural studies on a number of early transition metal aryl oxide compounds containing eta^2-iminoacyl ligands. This work has allowed us to isolate and study compounds containing more than one eta^2-iminoacyl function, a situation as yet unknown for their eta^2-acyl counterparts. Compounds such as these are of importance as they may give insights into the pathways whereby the observed intramolecular coupling (carbon-carbon double bond formation) of these types of ligand can take place to produce enediolate, enamidolate, or ene-diamide functional groups.

16410 **Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes.** Hopkins, M.D.; Schaefer, W.P.; Bronikowski, M.J.; Woodruff, W.H.; Miskowski, V.M.; Dallinger, R.F.; Gray, H.B. (California Institute of Technology, Pasadena). *Journal of the American Chemical Society;* **109**: No. 2, 408-416(21 Jan 1987).

The authors have recently undertaken an investigation of the spectroscopic, magnetic, photophysical, and photochemical properties of a large number of derivatives of the $M_2X_4L_4$ type (M = Mo, W; X = Cl, Br, I; L = uncharged σ-donor ligand), which form one of the largest subclasses of quadruply bonded dimers. One of the more striking findings of these studies is that parameters such as ($\delta \rightarrow \delta^*$) transition energies, electronic absorption and emission band shapes and intensities, and the rates of radiative and nonradiative excited state decay, which are properties associated with the formally metal-metal-localized manifold of electronic states, display a marked sensitivity to the nature of ligands X and L. In order to determine whether this ligand dependence is also reflected in the ground-state properties of these complexes, as well as to provide a structural benchmark for analyzing ligand perturbations of their excited states, they determined the crystal structures of two such derivatives, $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes. These results are reported herein, along with a general interpretation of the ligand sensitivity of the energies and intensities of the ($\delta \rightarrow \delta^*$) transitions of quadruply bonded dimers.

16411 **ESR studies on the radical cation mechanism of the ring opening of cyclopropylamines.** Qin, X.; Williams, F. (Univ. of Tennessee, Knoxville). *Journal of the American Chemical Society;* **109**: No. 2, 595-597(21 Jan 1987).

Cyclopropylamine radical cations have been implicated in the mechanism of inactivation of monoamine oxidase and cytochrome P-450 by cyclopropylamines. The key step in the proposed mechanism is illustrated for the parent compound in Scheme I and consists of the ring opening of the aminium radical cation 1 to the carbon-centered radical 2 which subsequently attacks the active site of the enzyme. Here they present ESR evidence for this ring-opening reaction and report that 2 is not converted to the nitrogen-centered radical 3 whereas the corresponding reaction for the neutral radical proceeds to completion at similar temperatures. These results provide a firm basis for the radical cation mechanism of enzyme inactivation, in keeping with the structural evidence that the inactivator is bound to the enzyme through carbon rather than nitrogen.

16412 **Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ (X^- = IBr_2^-, AuI_2^-, I_3^-).** Whangbo, M.; Williams, J.M.; Schultz, A.J.; Emge, T.J.; Beno, M.A. (North Carolina State Univ., Raleigh). *Journal of the American Chemical Society;* **109**: No. 1, 90-94(7 Jan 1987). Contract W-31-109-ENG-38;FG05-86ER45259.

On the basis of the crystal structures of β-$(ET)_2X$ (X^- = IBr_2^-, AuI_2^-, I_3^-) determined at low temperature under ambient and applied pressure, they examined the structural factors responsible for the occurrence of the structural modulation in β-$(ET)_2I_3$ under ambient pressure, its disappearance under pressure greater than $\sim$ 0.5 kbar, and its effect on the superconducting transition temperature T/sub c/ and the dependence of T/sub c/ on anion X^- in β-$(ET)_2X$. ET is an abbreviation for BEDT-TTF, i.e., bis(ethylenedithio)tetrathiafulvalene. The electron-phonon coupling constants, λ, calculated for β-$(ET)_2X$ on the basis of the McMillan equation suggest that the lattice softness with respect to translational and/or librational modes of vibration increases in the order β-$(ET)_2I_3$ < β-$(ET)_2IBr_2$ < β-$(ET)_2AuI_2$ < β^*-$(ET)_2I_3$, where β^*-$(ET)_2I_3$ refers to the β-$(ET)_2I_3$ salt under an applied pressure greater than $\sim$ 0.5 kbar with T/sub c/ similarly ordered 8 K. They also discuss the importance of hydrogen...anion interactions in understanding the lower T/sub c/ values (1-1.5 K) of the other class of organic superconductors $(TMTSF)_2X$ (X^- = ClO_4^-, PF_6^-) compared to the β-$(ET)_2X$ systems and the implications concerning the synthesis of new organic superconductors.

16413 **Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$.** Sen, A.; Chen, J.T.; Vetter, W.M.; Whittle, R.R. (Pennsylvania State Univ., University Park). *Journal of the American Chemical Society;* **109**: No. 1, 148-156(7 Jan 1987). Contract FG02-84ER13295.

The α-ketoacyl chloro complexes, trans-$M(PPh_3)_2(Cl)(COCOR)$ (M = Pt: R = Ph, 1a; R = p-FC_6H_4, 1b; R = p-ClC_6H_4, 1c; R = p-MeC_6H_4, 1d; R = Me, 1e. M = Pd: R = Ph, 2), were synthesized by the oxidative addition of the appropriate α-ketoacyl chloride with either $Pt(PPh_3)_4$ or $Pd(PPh_3)_4$. The crystal structure of 1a showed a square-planar geometry around the Pt with the two carbonyl groups virtually coplanar and in an s-trans configuration. The above compounds were found to decompose thermally to the corresponding benzoyl compounds, trans-$M(PPh_3)_2(Cl)(COR)$. A detailed kinetic study of the decarbonylation of 1a and 2 indicated the presence of two competing pathways, one of which involved the initial dissociation of a PPh_3 ligand. The kinetic and thermodynamic parameters for the various steps in the mechanism were determined.

16414 **σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds.** Thompson, M.E.; Baxter, S.M.; Bulls, A.R.; Burger, B.J.; Nolan, M.C.; Santarsiero, B.D.; Schaefer, W.P.; Bercaw, J.E. (California Institute of Technology, Pasadena). *Journal of the American Chemical Society;* **109**: No. 1, 203-219(7 Jan 1987). Contract FG03-85ER13431.

The authors report herein synthetic and structural studies of hydride and hydrocarbyl derivatives of permethylscandocene, together with investigations of their reactivities with H_2 and hydrocarbons. Experiments designed to probe the mechanism of these processes have been carried out, and the possibility of involvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds has been examined. A picture of the transition state for such σ-bond metathesis reactions is developed, which accounts for the relative reactivities of sp-, sp^2-, and sp^3-hybridized C-H bonds with Cp^*_2Sc-R (R = H, alkyl, aryl).

16415 **Facile reductive cleavage of the C=O bond of acyl halides and the C identical with N bond of nitriles by hydrogen in the presence of sulfido-bridged molybdenum complexes.** Coons, D.E.; Laurie, J.C.V.; Haltiwanger, R.C.; DuBois, M.R. (Univ. of Colorado, Boulder). *Journal of the American Chemical Society;* **109**: No. 1, 283-285(7 Jan 1987).

The authors have recently reported that cationic dinuclear molybdenum complexes of the type $[(CpMo)_2(S_2CH_2)(\mu\text{-}S)(\mu\text{-}SR)]^+$ undergo unusual reactions with molecular hydrogen to form protons and types of molybdenum and organic products which vary depending on the nature of R. They report here extensions of this reactivity which result in the reductive cleavage of the C=O and C identical with N bonds in acyl halides and nitriles, respectively, under mild homogeneous conditions.

16416 **Ambient-pressure organic superconductor.** Williams, J.M.; Wang, H.H.; Beno, M.A. (to Dept. of Energy, Washington, DC). US Patent 4,632,776. 30 Dec 1986. Filed date 18 Apr 1986. vp.

A superconductor is described comprising a first layer of a compound with superconductor properties having the formula (ET)/sub 2/MX/sub 2/ where ET is bis(ethylenedithio)tetrathiafulvalene. M is a metal, X is a halide, and MX/sub 2/ is symmetrical. The superconductor also comprises a second supporting layer of a conductive metal.

16417 **Estimated core electron binding energies and their application in the interpretation of valence ionization potentials.** Jolly, W.L. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* 90: No. 26, 6790-6793(18 Dec 1986). Contract AC03-76SF00098.

Empirical group shifts for estimate of the core electron binding energies of compounds of 14 elements are evaluated. It is shown, for elements of the first row of the periodic table, that simple one-parameter groups shifts are inadequate for estimating core binding energies of highly positively charged atoms with polarizable ligands. In the case of carbon 1s binding energies, a method involving two parameters - an electronegativity parameter and a polarizability parameter - is devised which significantly improves the accuracy of the predictions. The nitrogen 1s binding energies of the aminoboranes, NH_2BH_2, $N(CH_3)_2BF_2$, $NH(CH_3)BF_2$, and NH_2BF_2, are estimated. These data, when combined with the nitrogen pπ ionization potentials, lead to the conclusion that there is an important degree of N-B π bonding in all of these molecules.

16418 **Preparation of 1,1'-dinitro-3,3'-azo-1,2,4-triazole.** Lee, K.Y. (to Dept. of Energy, Washington, DC). US Patent 4,623,409. 18 Nov 1986. Filed date 5 Mar 1985. vp.

This patent describes a composition of matter which comprises 1,1'-dinitro-3,3'-azo-1,2,4-triazole.

16419 **Micromixing and multiple steady state transitions in a CSTR.** Puhl, A.; Nicolis, G. (Universite Libre de Bruxelles, Belgium). *Chemical Engineering Science;* 41: No. 12, 3111-3117(1986). Contract AS05-81ER10947.

Using the micromixing concept introduced by Zwietering they describe the effect of incomplete stirring on consecutive reactions exhibiting bistability transitions in a CSTR. In particular they explain the difference in the behavior of the system when reactant feed streams are premixed or non-premixed. A perturbation expansion around the fast stirring limit provides analytical results.

4004 Electrochemistry

16420 **(DOE/ER/10694—1-Final) The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report].** (Massachusetts Inst. of Tech., Cambridge (USA)). 1 Dec 1986. Contract AC02-80ER10694. 87p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87003413.

Zirconia-yttria solid electrolyte electrochemical reactors with platinum electrodes were investigated for the co-production of electrical energy and useful chemicals, specifically butadiene, styrene and nitric oxide. 54 refs., 43 figs., 1 tab.

16421 **Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes.** DuBois, D.L.; Miedaner, A. (Solar Energy Research Institute, Golden, CO). *Journal of the American Chemical Society;* 109: No. 1, 113-117(7 Jan 1987).

The preparation and characterization of complexes of the type $[M(triphos)L](BF_4)_2$ are described (for M = Ni, L is $P(OMe)_3$ and PEt_3; for M = Pd, L is CH_3CN, $P(OMe)_3$, PEt_3, $P(CH_3OH)_3$, and PPh_3; for M = Pt, L is PEt_3; triphos is $PhP(CH_2CH_2PPh_2)_2$). On the basis of cyclic voltammetry and bulk electrolysis experiments, the Pd complexes are shown to catalyze the electrochemical reduction of CO_2 to CO in acidic acetonitrile solutions. The analogous Ni and Pt complexes are not catalysts for CO_2 reduction under the same conditions. Kinetic studies have been carried out on $[Pd(triphos)(PEt_3)](BF_4)_2$ and a mechanism for the reduction of CO_2 is proposed.

16422 **Process for measuring degradation of sulfur hexafluoride in high voltage systems.** Sauers, I. (to Dept. of Energy, Washington, DC). US Patent 4,633,082. 30 Dec 1986. Filed date 23 Apr 1985. vp.

A process is described for detecting by-products from electrically induced degradation of SF/sub 6/ in high voltage systems comprising: at a pressure within the reaction cell sufficient to cause electron attachment to SF/sub 6/, placing an SF/sub 6/ gas to be tested in an ion-molecule reaction cell having a cathode at a first end, an anode opposite the cathode at a second end, a pin hole aperture incorporated into the anode that opens into a negative ion mass spectrometer that is at a lower pressure than is the reaction cell; producing thermal electrons at the cathode thereby ionizing molecules of the SF/sub 6/ gas in the vicinity of the cathode to form SF/sub 6//sup -/ ions; applying an electrical field in the reaction cell to induce the transfer of the SF/sub 6//sup -/ ions from the cathode to the anode resulting in the formation of by-product ions from intervening by-product molecules having a high affinity for fluoride ions; introducing a combination of the SF/sub 6//sup -/ ions and the by-product ions into the pin hole aperture thereby effecting flow of the combination of ions from the reaction cell to the negative ion mass spectrometer; and detecting the by-product ions using negative ion mass spectrometry techniques.

4005 Photochemistry

REFER ALSO TO CITATION(S) 16351, 16373, 17078, 17082

16423 **(DOE/ER/13247—3) Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987.** Koval, C. (Colorado Univ., Boulder (USA)). Dec 1986. Contract FG02-84ER13247. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003994.

Kinetics at metal electrode/solution interfaces has been studied for decades and the understanding of electron transfer processes is relatively mature. Despite numerous experimental studies during the past 10 years, many fundamental questions regarding redox processes at semiconductor/liquid junctions, even in the absence of light, remain unanswered. We have attempted to resolve some of these questions by making measurements that are analogous to those that were crucial for detailed understanding of electrochemistry at metals. The key aspects of our semiconductor studies are: (1) use of semiconducting materials and surface preparations that result in reproducible and stable interfacial energetics; (2) using both p- and n-type electrodes with a wide range of doping densities; (3) use of nonaqueous solvents to minimize surface corrosion processes; (4) thorough characterization of the interfacial energetics by measuring the capacitance of the space charge region over the same regions of electrode potential used in voltammetric experiments; and (5) use of substituted metallocenes as solution redox probes in order to insure $1e^-$, outer-sphere reactions with varying reduction potentials yet constant reorganization energies. 22 refs., 3 figs., 2 tabs.

16424 **Formation of long carbon chain molecules during laser vaporization of graphite.** Heath, J.R.; Zhang, Q.; O'Brien, S.C.; Curl, R.F.; Kroto, H.W.; Smalley, R.E. (Rice Univ., Houston, TX). *Journal of the American Chemical Society;* 109: No. 2, 359-363(21 Jan 1987).

Graphite is laser vaporized into a He carrier gas containing various simple molecules such as H_2, H_2O, NH_3, and CH_3CN, supersonically expanded, and skimmed into a molecular beam, and the beam is interrogated by photoionization time-of-flight mass spectrometry. Without added reactants in the He carrier gas, C/sub n/ species up to n = 130 are readily observed. Two distributions separated at about n = 40 appear to be present with the low n species the focus of this work. In the presence of added reagents, new species appear as a result of reaction. These are satisfactorily explained on the basis that a significant proportion of the C/sub n/ species initially formed are reactive radicals with linear carbon chain structures which can readily add H, N, or CN at the ends to form relatively stable polyynes or cyanopolyynes. Some of the cyanopolyynes detected have also been observed in the interstellar medium, and circumstellar carbon condensation processes in the atmospheres of carbon-rich stars similar to those studied here are suggested as possible synthetic sources.

16425 **Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens.** Hurst, J.K.; Thompson, D.H.P.; Connolly, J.S. (Oregon Graduate Center, Beaverton). *Journal of the American Chemical Society;* 109: No. 2, 507-515(21 Jan 1987). Contract AC06-83ER13111.

Triplet state lifetimes of several photoredox-active anions were shortened by adding N-alkyl-N-methyl-4,4'-bipyridinium (C/sub n/MV^{2+}) ions in the presence of dihexadecyl phosphate (DHP) vesicles. Optical spectroscopic measurements indicate that the predominant reaction mechanism is one-electron oxidative quenching. For [5,10,15,20-tetrakis(4-sulfonatophenyl)porphinato]zinc(II) ($ZnTPPS^{4-}$) ion, yields of charge-separated product ions are high, so that overall quantum yields exceeding 0.5 redox pairs per photon absorbed can be realized; for tetrakis(diphosphito)diplatinate(II), tris(4,7-bis(4-sulfonato-benzyl)-1,10-phenanthroline)ruthenate(II), and tris(4,4'-dicarboxylato-2,2'-bipyridine)ruthenate(II) yields are markedly less, a consequence of their shorter intrinsic triplet lifetimes and poor cage escape yields. In the absence of vesicles, product formation is negligible because ion pairing of viologens with sensitizers is extensive, giving rise to static quenching of the photoexcited states. The ionic strength dependence of the kinetics of $^3ZnTPPS^{4-}$ ion oxidation by C/sub n/MV^{2+}-DHP particles suggests a diffusion-controlled mechanism with electron transfer occurring over a distance of separation approximating the hard-sphere collision diameter of sensitizer and viologen.

16426 **Proximity effect in molecular photophysics: dynamical consequences of Pseudo-Jahn-Teller interaction.** Lim, E.C. (Wayne State Univ., Detroit, MI). *Journal of Physical Chemistry;* 90: No. 26, 6770-6777(18 Dec 1986).

The authors present here photophysical properties of nitrogen-heterocyclic and aromatic carbonyl compounds that can be attributed to vibronic coupling between nearby $n\pi^*$ and $\pi\pi^*$ states (proximity effect). These compounds often exhibit luminescence (fluorescence and/or phosphorescence) that is strongly dependent upon temperature, the nature of the solvent, chemical substitution, and the position of the deuterium substitution. Many of these complexities can be traced to the vibronic interaction between closelying $n\pi^*$ and $\pi\pi^*$ states, which leads to a large increase in the nonradiative decay rate of the lowest excited state. This phenomenon, which they have termed proximity effect, has been a subject of extensive studies in recent years, and there is now compelling evidence that the photophysical behavior of the lowest excited state in these molecular is strongly influenced by the proximity effect.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 15413

16427 **(CEA-CONF—8520) Thermodynamic properties of hydrated electron.** Hickel, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 3p. (In French). (CONF-8606229—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750455.

From 3. workshop on radiations chemistry; Autrans, France (10 Jun 1986).

Published in summary form only.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 16818, 17140

16428 **(CEA-CONF—8455) Synthesis and structure of $[(UO_2)_6(N_3)_{16}O_2]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$.** Livet, J.; Musikas, C.; Nierlich, M.; Charpin, P.; Vignier, D. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Apr 1986. 3p. (CONF-8604262—2-Summ.). CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92, France. Inst. de Recherche Technologique et de Developpement Industriel (IRDI).

From 16. meeting on actinides; Eibsee, F.R. Germany (28 Apr 1986).

Published in summary form only.

16429 **(EUR—10444) Chemical behaviour of Np, Pu and Am in various concentrated salt solutions.** Kim, J.I.; Apostolidis, C.; Buckau, G. (Commission of the European Communities, Luxembourg). 1986. 128p. (In German). NTIS (US Sales Only), PC A07/MF A01. File Number DE87750586.

The chemical behaviour of Np, Pu and Am in various brine solutions has been investigated. The study deals with important basic chemical processes, i.e. solubility, hydrolysis reaction, complexation, redox reaction, colloid generation. The nuclides used are ^{237}Np, ^{238}Pu, ^{239}Pu and ^{241}Am in the form of oxide or/and hydroxide, whereas the saline solution comprises are NaCl-solution of different concentration (0.1 approximately 5 M), Na3γ-salt solution, quinary solution (Q) and saline groundwaters from Gorleben. This paper reports equilibrium solubilities of the nuclides under varying geochemical parameters, Ph, Eh and CO_2; thermodynamic constants of hydrolysis reactions of NpO^+_2, Pu^{4+}, PuO^{2+}_2, Am^{3+} and AmO^+_2 ions; colloid generation and characterization; speciation; alpha radiolysis effect on dissolution. Complexation and kinetics of redox reactions are only being referred to earlier or on-going works. The speciation has been conducted for relatively higher concentrations by spectrophotometry and for very dilute solutions by laser induced photoacoustic spectroscopy (LPAS). Based on the results from this work and on the literature data, the speciation diagrams of pH-Eh correlation are produced for each element. 66 refs.

16430 **(KFK—4134) Analytical instruments at the Institute of Radiochemistry.** Coerdt, W.; Gantner, E.; Gilbert, E.; Guesten, H.; Klewe-Nebenius, H.; Mainka, E.; Niekusch, E.; Noppel, E.; Ruf, H.; Schoof, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie). Aug 1986. 68p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87750517.

The analytical instruments available at the Institute of Radiochemistry of the Nuclear Research Center Karlsruhe are described. Important instrumental parameters as well as the methods of preparation and measurement are discussed and examples of typical applications from the field of work of the Institute are given.

16431 **(RCM—02286) Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions.** Lierse, C.; Kim, J.I. (Technische Univ. Muenchen, Garching (Germany, F.R.). Inst. fuer Radiochemie). Jun 1986. 245p. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87750522.

The hydrolysis reactions of Pu(IV) and Pu(VI) and the carbonate complexation of Pu(IV) have been investigated by solubility experiments and spectrophotometric measurements. Stability constants are determined for the complexes: Pu(OH)/sub x//sup 4-x/, PuO/sub 2/(OH)/sub x//sup 2-x/ and Pu(OH)/sub x/(CO/sub 3/)/sub y//sup 4-x-2y/. The formation of polymeric as well as colloidal species in solution is identified spectroscopically with the aid of ultrafiltration. The redox behaviour of Pu(III), Pu(IV), Pu(V) and Pu(VI) in carbonate solution has been studied by spectrophotometry and differential pulse polarography, and kinetic data are determined for the disproportionation of Pu(V) as well as the autoreduction of Pu(VI). Based on the redox potential of the couple Pu(VI)/Pu(V) in 1 M Na/sub 2/CO/sub 3/, the stability constant of the complex PuO/sub 2/(CO/sub 3/)/sub 3//sup 5-/ is evaluated. The results from the present work are compared with all those data known hitherto in the literature.

16432 **Studies of the chemical behavior of carrier-free / sup 68/Ge. Pt. 3. Adsorptive properties.** Mirzadeh, S.; Kahn, M. (Brookhaven National Lab., Upton, NY, USA. Medical Dept.; New Mexico Univ., Albuquerque, USA. Dept. of Chemistry). *Radiochimica Acta;* 39: No. 4, 189-194(1986). Contract AC02-76CH00016.

The adsorption of carrier-free /sup 68/Ge on various surfaces was studied 1. in dilute HCl (< 0.1 M), neutral, and basic (< 0.1 M) solutions, 2. in strong acidic solutions (> 6 M), and 3. in moderately acidic solutions (0.1 to 5 M) in the presence of sulfide ion. The adsorbent surfaces included Pyrex, quartz, Teflon, polyethylene, powdered glass, platinum foil, hydrated metal oxides, colloidal sulfur, and performed acid insoluble sulfides.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

16433 (N—87-11960) Simulations of turbulent mixing and reacting flows and their applications to turbulence modeling. Semiannual progress report. Ferziger, J.H.; Cantwell, B.J. (Stanford Univ., CA (USA)). Jul 1986. 21p. (NASA-CR—179829; NAS—1.26:179829). NTIS, PC A02/MF A01.

The method of full simulation is applied to reacting turbulent flows. Full simulation has proven of great value as a complement to experiments for the study of nonreacting turbulent flows. It provides insight into the physics of turbulent flows and their modeling. It is natural to try to extend these methods to the simulation of reacting turbulent flows. Because this is one of the first attempts at this type of simulation, a subsidiary goal of this work is to demonstrate the feasibility of using simulation to study turbulent reacting flows. In addition, it is shown that such simulations can be used to provide physical insight into the nature of turbulent combustion and to provide data that will help to construct models that can be used in engineering simulations of turbulent reacting flows.

16434 Conditional sampling for fuel and soot in CARS thermometry. Eckbreth, A.C.; Anderson, T.J.; Dobbs, G.M. (United Technologies Research Center). pp 16 of Proceedings of the 21st symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

Soot production in propulsion and automotive powerplants is highly undesirable from both durability and emissions standpoints. Laser diagnostic techniques offer the potential for increasing the level of fundamental understanding required to implement successful soot reduction strategies. Temperature plays a key role in both the particle formation and burnout stages. In the time varying environments typical of all practical combustion devices, it is desirable to tag each temperature measurement as to whether the measurement emanates from a fuel rich or soot laden region. Such a conditionally-sampled temperature pdf should expedite insight into the fundamental sooting behavior of practical flames. For practical flames, coherent anti-stokes Raman spectroscopy (CARS) is the preferred approach to nonintrusive, spatially and temporally-precise temperature and major species concentration measurements. In this paper, the authors formulate and experimentally explore various "conditional sampling" strategies to simultaneously sense for fuel and soot presence when performing N/sub 2/ CARS thermometry in turbulent, soot forming flames. Soot sensing strategies are based upon spectroscopic detection of the C/sub 2/ produced during the laser vaporization of the particles; both incoherent and coherent strategies are investigated. Fuel presence is sensed through coherent wave mixing in the fuel or major fuel pyrolysis products. Many of the strategies formulated exploit the newly developed dual broadband Stokes approach to CARS which permits measurements from a number of constituents simultaneously.

16435 The reaction of atomic hydrogen with the formyl radical. Harding, L.B.; Wagner, A.F. (Argonne National Lab., Argonne, IL). pp 29 of Proceedings of the 21st symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—). Contract W-31-109-ENG-38.

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

The addition and abstraction reaction pathways on the potential surface of H + HCO have been characterized by an ab initio four electron, complete active space, self-consistent field electronic structure calculation. The elimination pathway to go from the excited adduct H/sub 2/CO* to products H/sub 2/ + CO has been characterized previously. All the theoretical information is used in variational transition state theory and RRKM calculations to determine a rate constant as a function of temperature and pressure. The room temperature calculated value is inconsistent with the earliest and highest experimental value but falls only slightly below the error bars of the two other and more recent experimental measurements. The results indicate that abstraction is the dominant process, followed by addition-elimination. Pressure-induced stabilization of the H/sub 2/CO* adduct is calculated to be quite minor in Ar buffer gas up to 1 atm. However up to a 40% change in the room temperature rate with a pressure change of from 10 to 760 torr is predicted for more efficient buffer gases such as CH/sub 4/. Experimental measurements to date have been too imprecise (errors of at least +- 20%) to detect such a pressure dependence.

42 ENGINEERING

REFER ALSO TO CITATION(S) 16236

16436 (ESA-ESTL—7) Activities report in space tribology. Progress report, 1985. Todd, M.J. (European Space Tribology Lab., Risley (UK)). Jan 1986. 17p. (ESA-CR(P)—2236; ETN—86-98114). NTIS, PC A02/MF A01.

The improvement in MoS_2 sputtered films, the elucidation of atmosphere effects on composite brushes and on MoS_2 films, and a method for Coulomb torque hysteresis prediction are described. Tests on the Giotto despin mechanism are outlined. Cryogenic tribology, solid lubricant films, gear tribology, and numerical analysis are discussed.

16437 (N—87-11717) Recent experiences in multidisciplinary analysis and optimization, part 1. Sobieski, J. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). 1984. 517p. (NASA-CP—2327-PT-1; NAS—1.55:2327-PT-1; CONF-8404323—Pt.1). NTIS, PC A22/MF A01.

From Symposium on recent experiences in multidisciplinary analysis and optimization; Hampton, VA, USA (24 Apr 1984).

Papers presented at the NASA Symposium on Recent Experiences in Multidisciplinary Analysis and Optimization held at NASA Langley Research Center, Hampton, Virginia April 24 to 26, 1984 are given. The purposes of the symposium were to exchange information about the status of the application of optimization and associated analyses in industry or research laboratories to real life problems and to examine the directions of future developments. Information exchange has encompassed the following: (1) examples of successful applications; (2) attempt and failure examples; (3) identification of potential applications and benefits; (4) synergistic effects of optimized interaction and trade-offs occurring among two or more engineering disciplines and/or subsystems in a system; and (5) traditional organization of a design process as a vehicle for or an impediment to the progress in the design methodology.

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 15377, 15391, 15394, 15395, 15396, 15398, 15401, 15477, 15478, 15479, 15480, 15482, 15483, 15484, 15585, 15793, 15843, 15910, 15923, 15997, 16001, 16002, 16114, 16128, 16129, 16130, 16131, 16318, 16416, 16711, 16916, 17328

16438 (BARC—1301) Cryogenic regenerators. (Bhabha Atomic Research Centre, Bombay (India)). 1986. 54p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87701264.

Importance of regenerators in cryogenic refrigerators is highlighted. Design aspects of regenerator are reviewed and the factors involved in the selection of regenerator material are enumerated. Various methods used to calculate the heat transfer coefficient and regenerator effectiveness are mentioned. Variation of effectiveness with various parameters is calculated by a computer programme using the ideal, Ackermann and Tipler formulae. Results are presented in graphical form. Listing of the computer programme is given in the Appendix. 22 refs., 14 figures.

16439 (BARC—1305) Pool type liquid helium cryopump. (Bhabha Atomic Research Centre, Bombay (India)). 1986. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701268.

Design and fabrication details of a pool type Liquid Helium Cryopump are described. It has got a liquid helium capacity of 5 litres and a/ pumping surface area of about 450 sq. cms. Three

types of baffles having different geometries are used for radiation shield. Effect on pumping speed for argon, carbon dioxide and nitrogen gas using the baffles is determined at various pressures. The circular array baffle geometry provides the maximum pumping speed. Using circular array type baffle the maximum pumping speed for nitrogen, argon and carbon dioxide are 2700 1/s, 3600 1/s, 2550 1/s respectively at a pressure of 6.0 x 10/sup -4/ torr. The ultimate pressure obtained is 3.0 x 10/sup -8/ torr. 16 refs., 6 tables, 5 figures.

16440 **(CONF-870134—1) 3-D world modeling with updating capability based on combinatorial geometry.** Goldstein, M.; Pin, F.G.; de Saussure, G.; Weisbin, C.R. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 11p. NTIS, PC A02. File Number DE87004257.

From Workshop on space telerobotics; Pasadena, CA, USA (20 Jan 1987).

This paper describes a 3-D world modeling technique using range data. Range data quantify the distances from the sensor focal plane to the object surface, i.e., the 3-D coordinates of discrete points on the object surface are known. The approach proposed herein for 3-D world modeling is based on the Combinatorial Geometry (CG) Method which is widely used in Monte Carlo particle transport calculations. First, each measured point on the object surface is surrounded by a small sphere with a radius determined by the range to that point. Then, the 3-D shapes of the visible surfaces are obtained by taking the (Boolean) union of all the spheres. The result is an unambiguous representation of the object's boundary surfaces. The "pre-learned" partial knowledge of the environment can be also represented using the CG Method with a relatively small amount of data. Using the CG type of representation, distances in desired directions to boundary surfaces of various objects are efficiently calculated. This feature is particularly useful for continuously verifying the world model against the data provided by a range finder, and for integrating range data from successive locations of the robot during motion. The efficiency of the proposed approach is illustrated by simulations of a spherical robot in a 3-D room in the presence of moving obstacles and inadequate prelearned partial knowledge of the environment.

16441 **(CONF-870301—6) Evaluating telerobotics for battlefield support operations.** Hamel, W.R.; Richardson, B.S.; Killough, S.M. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01. File Number DE87003005.

From International topical meeting on remote systems and robotics in hostile environments; Pasco, WA, USA (29 Mar 1987).

A general-purpose mobile robotics and teleoperations testbed is being developed for studying the application of telerobotics on the battlefield. The system, which will provide effective teleoperation capability and task-dependent, selectable robotic functions, will be used to address the functional feasibility of mobile telerobotics technology with emphasis on soldier-machine interface issues and allocation of operator control functions.

16442 **(EUR—10107) Survey of existing literature in the field of shock-absorbing materials with a view to subsequent adaptation of plastic deformation codes. Phase 1.** Draulans, J.; Fabry, J.P.; Lafontaine, I.; Richel, H.; Guyette, M. (Commission of the European Communities, Luxembourg). 1985. 88p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87750552.

Shock-absorbing materials and structures can be used as part of the transport container structure or of the truck equipment. An extensive survey of the literature has provided much information. Investigation has been made to define the required experimental procedures necessary to measure the missing material properties. Three codes had been selected: EURDYN, MARC-CDC and SAMCEF. For code evaluation, a schematic container model has been considered to serve as a benchmark for the evaluation of plastic deformation. For the shock-calculation, the container falls from a height of 9 meters along the direction of its cylinder axis on an unyielded flat surface. The EURDYN computer code, has been selected first as it is especially designed to handle dynamic problems, preferably plastic ones. Indeed, EURDYN uses an explicit integration scheme versus time, which makes it quite efficient to run short deformation processes such as absorber collapses. The SAMCEF computer code could not readily calculate the benchmark, also a visco-plastic flow model has been added to it. The MARC computer code was supposed to be a candidate to run shock-calculation but extensive computing time and engineering efforts would be required, it was replaced by the PLEXUS code. The results obtained using the SAMCEF programme confirm those obtained with EURDYN. The PLEXUS results are in between. The proposed benchmark calculation is at the border of the capabilities of the most advanced computer codes for plastic-dynamic calculations. Indeed, a complex energy absorption process seems to take place in a narrow region, moving versus time, where very large shape inversions occur. That requires an accurate modelling of the system in the deformed regions and a skilful choice of the numerical parameters of the computer run. The three tested codes gave qualitatively consistent results and confirm some scarce experimental results.

16443 **(N—87-11965) Losses in fountain-effect pumps.** Kittel, P. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center). Apr 1986. 9p. (NASA-TM—88232; A—86184; NAS—1.15:88232). NTIS, PC A02/MF A01.

Three loss mechanisms in fountain-effect pumps are identified and analyzed. Two of these mechanisms reduce the mechanocaloric effect, by reducing the mass transferred per unit heat input. The first loss mechanism of these losses is the result of normal fluid leakage through the pump. The second loss mechanism is the result of the finite separation between the porous plug and the heater. The third loss mechanism reduces the thermomechanical effect. It results from the Gorter-Mellink interaction within the porous plug. All three of these loss mechanisms are shown to reduce pump efficiency. They are then applied to an example to illustrate the relative significance of the three mechanisms.

16444 **(N—87-12018) User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options.** Anderson, M.S.; Williams, F.W.; Banerjee, J.R.; Durling, B.J.; Herstrom, C.L.; Kennedy, D.; Warnaar, D.B. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Nov 1986. 50p. (NASA-TM—87669; NAS—1.15:87669). NTIS, PC A03/MF A01.

A computer program is described which is especially suited for making vibration and buckling calculations for prestressed lattice structures that might be used for space application. Structures having repetitive geometry are treated in a very efficient manner. Detailed instructions for data input are given along with several example problems illustrating the use and capability of the program.

16445 **(SAND—86-1907C) Graphics NC generation in a prototype machining laboratory: CAM report.** Burd, W.C. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 40p. (CONF-8610203—1). NTIS, PC A03/MF A01. File Number DE87002494.

From CIM SUBWOG 39E meeting; Aldermaston, UK (6 Oct 1986).

We present the current and planned use of CAD/CAM tools at the Sandia National Laboratories (Albuquerque) in the prototype NC machining laboratory. We concentrate on the requirement of flexibility and the application of ANVIL-4000. The presentation includes several examples of parts requiring turning, 3-axis, and multi-axis NC tool paths. The discussion includes conclusions regarding software tools and techniques that have produced good results.

16446 **(SAND—86-2474C) Cask technology program activities.** Allen, G.C. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 9p. (CONF-861032—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87001733.

From High level waste business: transportation, storage and disposal; Charleston, SC, USA (19 Oct 1986).

The civilian waste cask technology program consists of five major activities: (1) technical issue resolution directed toward NRC and DOT concerns, (2) system concept evaluations to determine

the benefits of proposals made to DOE for transportation improvements, (3) applied technology and technical data tasks that provide independent information and enhance technology transfer between cask contractors, (4) standards development and code benchmarking that provide a service to DOE and cask contractors, and (5) testing to ensure the adequacy of cask designs. The program addresses broad issues that affect several cask development contractors and areas where independent technical input could enhance the Office of Civilian Radioactive Waste Management goals.

16447 **Computer-aided design of glove boxes and enclosures.** Schlanger, E.H.; Dallal, D.M. (Stearns Catalytic Corp.). *Transactions of the American Nuclear Society;* **53**: 119(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Stearns Catalytic Corporation has been involved in the design of over 500 linear feet of glove boxes and enclosures in the execution of major engineering projects during the past several years. The implementation of a computer aided design (CAD) program, specifically developed for this effort, has dramatically improved the quality of the final product while producing significant cost savings. The CAD program, based on a two-dimensional modeling concept, operates in conjunction with a state-of-the-art interactive computer graphics system.

16448 **PC-class microcomputer experience in radiation protection and shielding analysis at INEL.** Yoon, W.Y.; Parsons, D.K.; Nigg, D.W. (Idaho National Engineering Lab., Idaho Falls). *Transactions of the American Nuclear Society;* **53**: 414-415(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Over the last few years, personal computer (PC)-class microcomputer systems (typified by the 16-bit IBM XT and AT and other comparable machines) have become generally available and relatively inexpensive. These small but powerful machines are capable of, and are currently being widely used for, a large variety of complex scientific and engineering calculations. This trend is expected to continue in the future with the introduction of even more advanced microprocessors and microcomputer systems. This summary covers some of the general characteristics of scientific computing in a PC environment, based on recent experience in PC code development and application at the Idaho National Engineering Laboratory (INEL). In addition, some specific examples of currently operational PC code modules released by INEL for use in the radiation protection and shielding analysis field are discussed.

16449 **Different perspectives on the use of personal computers for technical analyses.** Libby, R.A.; Doherty, A.L. (Battelle Human Affairs Research Center). *Transactions of the American Nuclear Society;* **53**: 415(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Personal computers (PCs) have widespread availability and use in many technical environments. The machines may have initially been justified for use as word processors or for data base management, but many technical applications are being performed and often the computer codes used in these technical analyses have been moved from large mainframe machines. The general feeling in the user community is that the free computer time on these machines justifies moving as many applications as possible from the large computer systems. Many of these PC applications cannot be justified if the total cost of using microcomputers is considered. A Hanford-wide local area network (LAN) is being established which allows individual PCs to be used as terminals to connect to mainframe computers at high data transfer rates (9600 baud). This system allows fast, easy connection to a variety of different computers with a few keystrokes. The LAN eliminates the problem of low-speed communication with mainframe computers and makes operation on the mainframes as simple as operation on the host PC, itself.

16450 **New buildup factor data for point kernel calculations.** Trubey, D.K.; Harima, Y. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* **53**: 416(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Modern buildup factor data are now available across the whole range of atomic number and source energies, and an accurate fitting function is available to reproduce these data in point kernel calculations on computers of all sizes.

16451 **Future of remote handling.** Grisham, D.L.; Lambert, J.E. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 486(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The field of remote handling started with the invention of mechanical master-slave and electromechanical manipulators in the late 1940s and early 1950s. Those developments and that of shielding windows applied in hot cells and bays remain the dominant application of remote handling. The development of electric master-slave manipulators in the 1950s under the direction of Ray Goertz, and further development and applications in accelerator and nuclear fuel reprocessing, has made advanced remote handling a viable scheme for many applications. In very recent times, the application of robotics to analytical chemistry, fuel pellet fabrication, and explosives handling is a precursor to an expanded application of that technology. This paper will review the state-of-the-art in three areas and offer the authors view of the future over approximately the next ten years.

16452 **High-definition television evaluation for remote handling task performance.** Fujita, Y.; Omori, E.; Hayashi, S.; Draper, J.V.; Herndon, J.N. (Pacific Northwest Lab., Richland, WA). *Transactions of the American Nuclear Society;* **53**: 486-488(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In a plant that employs remote handling techniques for equipment maintenance, operators perform maintenance tasks primarily by using the information from television systems. The efficiency of the television system has a significant impact on remote maintenance task performance. High-definition television (HDTV) transmits a video image with more than twice the number of horizontal scan lines as standard-resolution television (1125 for HDTV to 525 for standard-resolution NTSC television). The added scan lines dramatically improve the resolution of images on the HDTV monitors. This paper describes experiments designed to evaluate the impact of HDTV on the performance of typical remote tasks. The experiments described in this paper compared the performance of four operators using HDTV with their performance while using other television systems. The experiments included four television systems: (a) high-definition color television, (b) high-definition monochromatic television, (c) standard-resolution monochromatic television, and (d) standard-resolution stereoscopic monochromatic television.

16453 **Manipulator comparative testing program.** Draper, J.V.; Handel, S.J.; Sundstrom, E.; Herndon, J.N.; Fujita, Y.; Maida, M. *Transactions of the American Nuclear Society;* **53**: 488-489(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The Manipulator Comparative Testing Program compared performance of selected manipulator systems under typical remote handling conditions. The site of testing was the Remote Operations and Maintenance Demonstration Facility operated by the Consolidated Fuel Reprocessing Program of the Oak Ridge National Laboratory. Three experiment examined differences among manipulator systems from the US and Japan. The manipulator systems included the Meidensha BILARM 83A, Central Research Laboratories' (CRL's) Model M-2, and GCA PaR systems Model 6000. Six manipulator and control mode combinations were evaluated: (a) the BILARM in master-slave mode without force reflection; (b) the BILARM in master-slave mode with force reflection; (c) the Model

M-2 in master-slave mode without force reflection; (d) the Model M-2 in master-slave mode with force reflection; (e) the BILARM with switchbox controls; and (f) the PaR 6000 with switchbox controls. The experiments also examined differences between master-slave systems with and without force reflections, and differences between master-slave systems and switchbox-controlled systems.

16454 **Training program requirements for remote equipment operators in nuclear facilities.** Palau, G.L.; Auclair, K.D. (Bechtel, Middletown, PA). *Transactions of the American Nuclear Society;* 53: 494-495(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

One of the most neglected areas in the engineering development of remotely operated equipment applications in nuclear environments is the planning of adequate training programs for the equipment operators. Remote equipment accidents cannot be prevented solely by engineered safety features on the equipment. As a result of the experiences in using remote equipment in the recovery effort at Three Mile Island Unit 2 (TMI-2), guidelines for the development of remote equipment operator training programs have been generated. The result is that a successful education and training program can create an environment favorable to the safe and effective implementation of a remote equipment program in a nuclear facility.

16455 **Use of CADD/CAE for remote vehicle system mission planning.** Auclair, K.D.; Palau, G.L. (Bechtel, Middletown, PA). *Transactions of the American Nuclear Society;* 53: 495-496(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Many factors contribute to the successful completion of a remotely operated vehicle mission. Among the most important is mission planning: a comprehensive evaluation of the objectives of the mission, the equipment and operator capabilities, and the physical constraints within the environment into which the equipment will be deployed. Experience gained during the recovery of Three Mile Island Unit 2 (TMI-2) indicates that computerized design and drafting systems (CADD) can be used as an effective aid in mission planning which can improve the efficiency, quality, and execution of tasks using remote vehicle systems. CADD systems can be utilized for pretask identification of alternative vehicle transit routes, interferences and obstructions to remote equipment movement, identification of landmarks from which the equipment operators can navigate, and operator familiarization with the physical layout and work area constraints. All of this can result in a reduction in the time and cost required to perform a job, and in a nuclear environment can also result in a significant reduction in personnel radiation exposure.

16456 **Tools for decontamination and decommissioning of nuclear facilities.** Hermetz, R.E. (Monsanto Research Corp., Miamisburg, OH). *Transactions of the American Nuclear Society;* 53: 496-497(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The decontamination and decommissioning (D & D) of nuclear facilities requires many different tools. These can vary from small hand tools to the heavy equipment used to remove concrete and soil. Tools for D & D should be reliable, versatile, economical, and easily disposed of in case they become contaminated. The experiences and information used as background for this paper where gained at the Mound Facility of the Monsanto Research Corporation in Miamisburg, Ohio. In the search to find tools to do the work proficiently, many tools were considered. The scheduled D & D tasks and the tools and equipment required for them are described.

16457 **Experience with the Surveyor mobile robot in radioactive work environments.** Kniazewycz, B.G.; Darvish, A.R.; Irving, T.L. (KLM Technologies, Inc., Walnut Creek, CA). *Transactions of the American Nuclear Society;* 53: 497-498(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper summarizes the development and implementation history of the Surveyor mobile robotic device from November 1985 through August 1986. This two-tracked remotely controlled tetherless device is used to conduct surveillance and inspection and light maintenance missions in nuclear power plants. Surveyor's relatively light weight (<400 lb) can easily be transported manually from location to location. The total maximum payload of the device, which is able to climb 40-deg stairs, is up to 300 lb when transported on a level floor. Surveyor can traverse through 14 in. of water and over 9-in.-high obstacles. Standard accessories include radiation detector, humidity monitor, temperature measurement, sound detection and position/ranging, and a standard video or CCD camera having a wide angle and telephoto lens. These devices are mounted on a 3 degree-of-freedom articulated arm with halogen lights.

16458 **Evaluation of glovebox sectioning using weld splitting techniques.** Titzler, P.A.; Allan, C.R. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* 53: 499-501(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A weld splitting method is being evaluated for sectioning austenitic stainless steel components. Testing consists of sectioning simulated stainless steel gloveboxes to determine the acceptability of using dissimilar metal splitting methods. The weld splitting mechanism, similar to liquid-metal embrittlement, results in a coating of the grain boundaries with a splitting agent such as copper through the material separation path. When copper is brought into contact with stainless steel during a welding operation and a critical stress level is present in the parent metal, the splitting phenomenon occurs. This technique has the advantage of sectioning without producing fines and smoke, and the disturbances to the far side of the material are minimized.

16459 **Interactive animated displayed of man-controlled and autonomous robots.** Crane, C.D. III; Duffy, J. (Univ. of Florida, Gainesville). *Transactions of the American Nuclear Society;* 53: 509-510(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An interactive computer graphics program has been developed which allows an operator to more readily control robot motions in two distinct modes; viz., man-controlled and autonomous. In man-controlled mode, the robot is guided by a joystick or similar device. As the robot moves, actual joint angle information is measured and supplied to a graphics system which accurately duplicates the robot motion. Obstacles are placed in the actual and animated workspace and the operator is warned of imminent collisions by sight and sound via the graphics system. Operation of the system in man-controlled mode is shown. In autonomous mode, a collision-free path between specified points is obtained by previewing robot motions on the graphics system. Once a satisfactory path is selected, the path characteristics are transmitted to the actual robot and the motion is executed. The telepresence system developed at the University of Florida has been successful in demonstrating that the concept of controlling a robot manipulator with the aid of an interactive computer graphics system is feasible and practical. The clarity of images coupled with real-time interaction and real-time determination of imminent collision with obstacles has resulted in improved operator performance. Furthermore, the ability for an operator to preview and supervise autonomous operations is a significant attribute when operating in a hazardous environment.

16460 **Update on active facilities at Harwell, UK.** Brown, P.E.; Bauer, G.J. (UKAEA, Harwell, England). *Transactions of the American Nuclear Society;* 53: 518-519(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The United Kingdom Atomic Energy Research Establishment at Harwell has an extensive range of active handling facilities that are available for use in support of the various facilities that are available for use in support of the various nuclear programs. Currently the facilities consist of: 1. High-activity handling cells which are heavily shielded concrete cells, capable of handling activities up to 10^6-MeV Ci. 2. Medium- and low-activity cells, which are either

concrete or lead shielded and equipped for mechanical, physical, and chemical examination of radioactive specimens. 3. Micro-handling cells which are equipped for micro-manipulation and detailed optical microscopy, scanning electron microscopy, and electron-probe microanalysis. Recent additions to improve the facilities include the introduction of a double-lidded transfer system to improve containment during posting operations, the introduction of a standard range of transfer flask and transport containers, and the use of circular filters for ease of replacement, disposal, and improved sealing arrangements.

16461 **Posting in/out technique in KfK hot cells.** Enderlein, H. (KfK, Karlsruhe, West Germany). *Transactions of the American Nuclear Society;* **53**: 519-520(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The concrete-shielded hot cells of Kernforschungszentrum Karlsruhe GmbH was constructed in the early 1960's. Over the years it became apparent that the original posting in/out technique, described in the paper, was no longer acceptable. Double lit locks of 500-mm diameter were provided in the cell ceiling hatches and unshielded containers fitting these hatches were procured. These actions led to a reduction in personnel exposure. Improvements made to the new posting in/out system since its implementation are discussed.

4203 Lasers

REFER ALSO TO CITATION(S) 16321, 17060, 17356, 17398, 17558, 17559

16462 **(AD-A—174034/9/XAB) Electron-pumped high-efficiency semiconductor laser.** Daneu; DeGloria, D.P.; Sanchez-Rubio; Tong, F.; Osgood, R.M. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 8 Sep 1986. 4p. (JA—5830). NTIS, PC A02/MF A01.

Electron-beam excitation is a well-known technique for generating stimulated emission in semiconductors. CdS has been among the more-commonly used II-VI compound semiconductors for generating visible laser radiation. Efficiencies approaching the theoretical limit of 30% were first measured in this material at cryogenic temperatures and more recently at room temperature. In general, two categories of devices have been the most extensively investigated: (1) lasers for use in projection television and based on scanned, focused, low-voltage, low-current electron guns, and (2) high-energy pulsed lasers excited by electron beams of large cross-sectional area, high voltage, and high peak current. Published data on the efficiency of the latter type of laser have not so far been attractive enough to warrant extensive development. This document discusses in detail the operation of high-power efficiency (3.5-14%), room-temperature, II-VI lasers pumped by a pulsed electron gun in the 200-300 keV range. High efficiency is obtained by careful optimization of both fabrication procedures and resonator structure.

16463 **(CEA-CONF—8497) Review of X-ray laser research at CEL-V.** Louis-Jacquet, M.; Adolf, A.; Berthier, E. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Apr 1986. 8p. (CONF-8604224—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750458.

From International colloquium on X-ray lasers; Aussois, France (14 Apr 1986).

Plasmas generated by laser irradiation of solid targets have demonstrated for a long time their non LTE behavior providing numerous states propitious to population inversions. So studying inversions and X-ray amplification is in keeping with the general pattern of the understanding of the plasma state and more precisely of the involved atomic processes. Moreover the recent fruitful experiments on X-ray amplification have enforced our interest, if it was not, in theoretical and experimental studies in this new field of investigation.

16464 **(CEA-CONF—8498) Ionization model for nickel-like gold.** Busquet, M.; Bruneau, J. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Apr 1986. 7p. (CONF-8604224—5). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750459.

From International colloquium on X-ray lasers; Aussois, France (14 Apr 1986).

Before we build an extensive population model for gold ionized 49 to 52 times, we have studied with a more simple model the effect of accounting for cascades (or dielectronic recombination) and $\Delta n = 0$ transitions. These transitions allow some understanding of typical feature of experimental gold spectra.

16465 **(CEA-R—5359) Bibliographic study of photophysical and photochemical properties of laser dyes.** Doizi, D. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Jun 1986. 92p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750538.

Laser isotope separation of uranium requires high power and precise wave length. This report is a bibliographic and experimental study of the photophysical and photochemical properties of seven commercial laser dyes which have an emission wavelength in the range 5500-6500 A: rhodamine 110 or 560, rhodamine 6G or 590, rhodamine B or 610, rhodamine 101 or 640, sulforhodamine B or kiton red 620, sulforhodamine 101 or 640 and DCM or LC 6500. Absorption and emission cross section values, fluorescence lifetimes and quantum yields in various solvents are indicated. For each dye, a non exhaustive list of laboratory experiments made with two types of pump sources: Nd YAG (532) and copper vapor laser is given. When it is known, the toxicity of the dyes is mentioned.

16466 **(LA-UR—87-83) Plasma energy balance model for optical-laser-induced impulse in vacuo.** Dingus, R.S.; Goldman, S.R. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 13p. (CONF-861177—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005113.

From 9. international conference on lasers and applications; Orlando, FL, USA (3 Nov 1986).

A simple plasma-energy-balance model, along with its derivation, is presented for calculating the impulse from targets in a vacuum exposed to single-pulse, optical lasers. Figures demonstrate that throughout most of the range of interest, results from the model agree well with experimental data and LASNEX radiation-hydrodynamic computer code calculations. The model assumes isothermal blowoff and thus takes advantage of the insensitivity of impulse to energy distribution within the ablated mass. The density profile in the blowoff plasma is estimated and the Saha equation is used to evaluate the degree of ionization. The laser absorption coefficient and thermal radiation opacity are evaluated as a function of position in the plasma in order to evaluate the energy reaching the ablation surface. An overall energy balance plus an energy balance at the ablation surface are used to determine the blowoff mass and temperature. The success of the model indicates that the impulse is insensitive to detailed interactions in the vicinity of the ablation surface. 10 refs., 3 figs.

16467 **(SAND—86-2121C) Nuclear reactor excitation of XeF laser gas mixtures.** Rice, J.K.; Hays, G.N.; Neal, D.R.; McArthur, D.A.; Alford, W.J. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 17p. (CONF-861177—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005060.

From 9. international conference on lasers and applications; Orlando, FL, USA (3 Nov 1986).

Kinetic studies of the XeF laser system and other laser media have been studied under low-power (several kW/cc), long-pulse (100 to 200 microseconds) pumping conditions using fission-fragment pumping. Results include the measurement of fluorescence from excited states of KrF, N_2^+, and XeF and optical gain near 351 nm in gas mixtures containing Xe, NF_3, and a rare gas. Sandia's fast-pulse reactor facility (SPR III) was used for these experiments, in which a cell containing the gas mixtures is irradiated with thermalized neutrons. Energy deposition in the gas occurs through the interaction of energetic charged particles produced by neutron-induced fission events. Two pumping modes have been ex-

amined. One mode uses ^{3}He as the rare gas, where charged particles from the ^{3}He(n,p)^{3}H reaction excite the medium. Another mode uses fission fragments from ^{235}U, which is coated on thin ceramic substrates, as the source of excitation. 7 refs., 10 figs.

16468 **Collective instability of a free electron laser including space charge and harmonics.** Murphy, J.B.; Pellegrini, C.; Bonifacio, R. (Brookhaven National Lab., Upton, NY). *Optics Communications;* 53: No. 3, 197-202(1 Mar 1985). Contract AC02-76CH00016.

The effects of harmonics, space charge and electron energy spread on the collective instability regime of an electron beam coupled to a planar undulator are analyzed. Both analytical and numerical results are presented. 9 references, 5 figures.

16469 **Red laser initiative at Los Alamos.** Barnes, N.P.; Meier, J.V.; Remelius, D.K. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp ThA2.1-ThA2.4 of Topical meeting on tunable solid state lasers. Digest of technical papers. Washington, DC; Optical Society of America (1985). (CONF-8505244—).

From Topical meeting on tunable solid state lasers; Arlington, VA, USA (16 May 1985).

Several solid state lasers systems tunable between 0.70 and 0.95 μm have been the subject of studies to identify new lasers for various programs at the Los Alamos National Laboratory. These solid state lasers include Cr:GSGG, Cr:GSAG and Ti:Sapphire. Both laser pumped flashlamp pumped results are described in the following sections.

16470 **Sustained performance of a 100 W, 240 Hz alexandrite laser.** Sam, R.C.; Rapoport, W.R.; Shand, M.L. (Military Laser Products, 31717 La Tienda Drive, Westlake Village, CA 91362). pp FA1.1-FA1.4 of Topical meeting on tunable solid state lasers. Digest of technical papers. Washington, DC; Optical Society of America (1985). (CONF-8505244—).

From Topical meeting on tunable solid state lasers; Arlington, VA, USA (16 May 1985).

The design of a high repetition rate, high power alexandrite laser was presented previously. This paper describes the current configuration and test results of the system.

16471 **Monochromator wavelength measurement device with six figure accuracy.** Barnes, N.P.; Gettemy, D.J.; Hinsley, R.J.; Deal, J.B.; Howell, J.; King, R.L.; Harker, W.C. (Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). pp FC6.1-FC6.3 of Topical meeting on tunable solid state lasers. Digest of technical papers. Washington, DC; Optical Society of America (1985). (CONF-8505244—).

From Topical meeting on tunable solid state lasers; Arlington, VA, USA (16 May 1985).

This device can measure the output of a laser with an accuracy of about one or two parts in the sixth place. A stabilized ring dye laser was set up and chopped to simulate a pulse laser. The output of the ring dye laser could be read on a commercial wavemeter for comparison. For initial investigation, only one reference laser, the stabilized HeNe, was used. This was used to calculate the intercept while the slope was determined through a calibration procedure. With this arrangement, the readings of this device and the commercial wavemeter agreed to one or two parts in the sixth place across the entire wavelength interval of interest, approximately the accuracy of the commercial wavemeter.

16472 **Transparent glass ceramics: Laser prospects.** Lempicki, A.; Edwards, M.; Beall, G.H.; Hall, D.; Andrews, L.J. (Boston Univ., Chemistry Dept., Boston, MA 02215). pp FA8.1 of Topical meeting on tunable solid state lasers. Digest of technical papers. Washington, DC; Optical Society of America (1985). (CONF-8505244—).

From Topical meeting on tunable solid state lasers; Arlington, VA, USA (16 May 1985).

A study of the luminescence of Cr/sup +3/ in inorganic glasses was first undertaken in order to develop a Luminescent Solar Concentrator. Broad absorption bands and near IR (vibronic) emission made the material promising for the purpose but universally low quantum efficiency (in glasses) negated that goal. Having observed that efficiency in crystals can be high, a development of glass ceramics, or crystallites precipitated in situ in a glassy matrix was undertaken. There is evidence that some of the crystalline phases (such as solid state solutions of Al/sub 2/O/sub 3/ and SiO/sub 4/) offer suitable octahedral sites for Cr/sup 3+/ and cause a migration of Cr from glass into the crystals. This results in greatly increased quantum efficiency. The optical quality of the ceramics is determined by the presence of two phases of slightly different refractive indices. Fortunately the size of the crystallites is much smaller than the wavelength of light, so that scattering is minimized, but its reduction nevertheless represents the main current challenge. Recent work reveals that there may be two categories of sites in mullite ceramics namely those corresponding to well defined crystallographic positions and those which do not. The latter are responsible for the nonexponential decay and the inhomogenious broadening of absorption and emission spectra. Except for absolute values of emission cross sections and excited state absorption, the requirements for an LSC and a laser are almost identical, hence much of the current development is driven by the prospects of a new type of solid state laser system based on these unique, poorly understood, yet promising, materials.

16473 **The influence of a plasma during laser welding.** Dixon, R.D.; Lewis, G.K. (Los Alamos National Lab., P.O. Box 1663, MS G770, Los Alamos, NM 87545). pp 44-50 of Proceedings of the materials processing symposium. Volume 38. Metzbower, E.A. Toledo, OH; Laser Institute of America (1983). (CONF-831195—).

From International congress on applications of lasers and electro-optics; Los Angeles, CA, USA (14 Nov 1983).

High speed movies of single pulse laser welds are correlated with optical emission from the plasma and the acoustic wave to study and model enhanced coupling. The movies and acoustic signals combine to support enhanced coupling through the development of a laser supported combustion wave.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 15791, 15792, 15794, 15795, 15835, 15859, 15936, 15937, 15938, 15942, 15943, 15953, 15982, 16433, 16448

16474 **(DOE/PC/90957—T1) Fluidization mechanisms in slurry flows: Quarterly report.** (University of Southern California, Los Angeles (USA)). Jan 1987. Contract FG22-86PC90957. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004507.

The major accomplishment during this quarter was the completion of the design for the slurry test loop. At the present time, all of the parts that require long delivery times have been ordered. The largest problem will be the pump which is scheduled for delivery sometime between March and April. It is anticipated that the construction of the test loop will take at least the next six to nine months depending on the delivery of parts and the availability of machinists and other support personnel. This is exactly on the time line suggested in the proposal. A description of the test loop and a description of the particle pressure transducers are presented in this report. 2 figs.

16475 **(KFK—4094) Velocity and turbulence distributions in wall subchannels of a rod bundle with a spacer grid.** Rehme, K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Aug 1986. 88p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750505.

Measurements of the mean velocity, of the wall shear stresses, and of the turbulence have been performed in two wall subchannels (P/D=1.223; W/D=1.183) of a rod bundle of four parallel rods arranged in a rectangular channel for three axial planes. For two planes, a spacer grid of the SNR-type was inserted in the rod bundle at ratios of distance between the spacer grid and the measuring plane and the hydraulic diameter of L/D/sub h/ =84.9 and 62.8, respectively. The measurements in the third axial

plane have been performed as a reference experiment at L/D=88.2 without the spacer grid. The Reynolds number of this investigation was Re=1.45x10/sup 5/. The results show that the distributions of the velocity, of the wall shear stresses, and of the turbulence are not completely developed at L/D/sub h/=88.2 for the reference experiment without the spacer grid. The symmetry of the distributions is improved by including the spacer grid in spite of the lower L/D/sub h/-ratio than for the reference experiment.

16476 **(N—87-11963) On the Maxwellian distribution, symmetric form, and entropy conservation for the Euler equations.** Deshpande, S.M. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Nov 1986. 30p. (NASA-TP—2583; L—16036; NAS—1.60:2583). NTIS, PC A03/MF A01.

The Euler equations of gas dynamics have some very interesting properties in that the flux vector is a homogeneous function of the unknowns and the equations can be cast in symmetric hyperbolic form and satisfy the entropy conservation. The Euler equations are the moments of the Boltzmann equation of the kinetic theory of gases when the velocity distribution function is a Maxwellian. The present paper shows the relationship between the symmetrizability and the Maxwellian velocity distribution. The entropy conservation is in terms of the H-function, which is a slight modification of the H-function first introduced by Boltzmann in his famous H-theorem. In view of the H-theorem, it is suggested that the development of total H-diminishing (THD) numerical methods may be more profitable than the usual total variation diminishing (TVD) methods for obtaining wiggle-free solutions.

16477 **(NP—7770059) Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers.** Hauenschild, R. (Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik). 17 Sep 1985. 219p. (In German). NTIS (US Sales Only), PC A10/MF A01. File Number DE87770059.

The heat and material transfer conditions which occur in the process of evaporation cooling on the air and water side are examined in detail in this work. Apart from the theoretical basis for calculating counterflow wet cooling towers, the behaviour of the heat and material transfer coefficients in coupled heat and material transfer is examined. The theoretical dependence on temperature of the Merkel figure is also described and the water side heat transfer resistance in evaporation is examined. Finally, the behaviour of the evaporation coefficient is determined, taking into account the water side heat transfer resistance. (HAG).

16478 **(UCRL—53774) A laser Doppler method for noninvasive measurement of flow velocity.** Biggs, G.L. (Lawrence Livermore National Lab., CA (USA)). 25 Nov 1986. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. File Number DE87005197.

Laser Doppler velocimetry is a powerful optical technique for noninvasively obtaining experimental flow-velocity data. This paper describes the principle of operation and various optical configurations of the laser Doppler velocimeter. As a sample application, we describe an experimental apparatus for measuring the velocity flow field around a cylinder, and give our experimental results.

16479 **Time-dependent nodal integral methods in linear and nonlinear heat conduction.** Wilson, G.L.; Rydin, R.A.; Azmy, Y.Y. (Univ. of Virginia, Charlotte). *Transactions of the American Nuclear Society;* **53**: 254-255(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The introduction of time dependence to nodal integral method is accomplished by the authors for both the linear heat conduction equation and the nonlinear heat conduction case. Several simple linear test problems with known solutions have been used to verify the accuracy of the method. The method serves as a sound base for continuing into the development of highly accurate time dependent fluid flow methods.

16480 **Finite difference solution procedure for convection-diffusion problems in irregular geometries.** Asfaw, A.; Glakpe, E.K. (Howard Univ., Washington, DC). *Transactions of the American Nuclear Society;* **53**: 257-258(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the present paper a solution method is described for convection-diffusion problems that are described by cylindrical polar coordinates in two-dimensional physical space. A simple algebraic nonorthogonal coordinate transformation is presented that maps a complex fluid domain onto a rectangular plane. In this new plane the transformed governing equations are finite differenced and are solved iteratively by using an implicit cell-by-cell procedure with upwind convective derivatives. As an example, the method is applied to the problem of laminar natural-convection heat transfer from an inner isothermal horizontal square cylinder to an outer concentric circular cylinder which is maintained at a lower but constant temperature. This problem models the fluid dynamics in a nuclear spent-fuel shipping cask in which the inner body represents a light water reactor fuel assembly.

16481 **Discussion of the numerical stability of an improved upwinding scheme.** Hassan, Y.A.; Kim, J.H. (Texas A & M, College Station). *Transactions of the American Nuclear Society;* **53**: 261-263(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The prediction of multidimensional heat transfer and fluid flow problems requires the solution of Navier-Stokes equations. Although the use of upwind approximation for the convection terms removes the potential of nonphysical spatial oscillations, such a procedure is burdened with excessive numerical diffusion. Recently published work by Smith and Hutton presented results for some 20 different candidate methods to estimate the convection terms. The overall conclusion was that none of the methods was totally successful. The more accurate methods exhibited nonphysical spatial oscillations. More recently, a procedure was proposed that alleviates the problem of false diffusion. The purpose of this paper is to present several challenging cases, with various flow orientation, to show that the proposed procedure always circumvents the negative coefficients in the discretization equation such that the influence coefficients cannot become negative. The Smith and Hutton test case has been examined to illustrate the merit of this technique. The results are competitive with a large majority of those examined by Smith and Hutton.

16482 **Two-phase flow demonstration device.** Best, F.R. (Texas A & M, College Station). *Transactions of the American Nuclear Society;* **53**: 55-56(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Teaching two-phase flow is sometimes constrained by the average person's lack of experience with the relevant phenomena. One uses examples of water boiling in a pot, drops of water on a hot griddle, etc., to illustrate various effects; however, these pool-boiling phenomena capture neither the dynamic aspects of two-phase flow nor student interest. In order to overcome this limitation, a low-cost demonstration device has been built to illustrate various two-phase flow situations as part of an introductory two-phase flow course. The purpose of this summary is to describe the device, list the flow regimes that can be created, and relate the student response to its use.

4205 Materials Testing

REFER ALSO TO CITATION(S) 15698, 15978, 16243, 16245

16483 **(JINR—R-7-85-261) Control and data acquisition system of the RIPS facility for the plastic property irradiation studies.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1985. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701336.

The multipurpose controle and data acquisition system designed for servicing measuring devices of the RIPS facility is described. The RIPS facility is used to carry out simulating material testing experiments, investigating plastic properties of materials using the JINR heavy ion cyclotron beams. The Z80 microprocessor, being a part of the ZX81 microprocessor, is the central processor of the system. Programming is performed in BASIC or computor code. The given program can be changed operatively in correspondence with experimental requirements. System efficiency is increased at the expence of interfacing existed between the ZX81 and the TRA 11/40 computers. The system has shown high performances. It can be used in experiments, where high rate of data acquisition is not required, and the number of parameters measured does'nt exceed 10. 3 refs.

16484 **(JINR-R—10-85-781) Neutron diffractometer at the IBR-2 reactor. Control system for four-circle goniometer.** Balagurov, A.M.; Barabash, I.P.; Ostrovnoj, A.I.; Shibaev, V.D.; Zastenker, I.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700808.

The control system for four-circle geniometer are described. It is used with the DN-2 diffractometer for monocrystal orientation. Position of goniometer axes is detemined by an optical-electrical device providing the 0.025 deg accuracy over phi, chi and ω axes and 0.05 deg over 2THETA axis. Control electronics is made in the CAMAC standard and connected with the MERA-60 computer. The control program permits to work with the geniometer in the interactive or automatic regimes. It permits to turn axes on the initial position, on a given angle, to test correctness of movement and to perform some service functions. 5 refs.; 3 figs.

16485 **Characterization of flaws using the zeroes of the real and imaginary parts of the ultrasonic scattering amplitude.** Kogan, V.G.; Hsu, D.K.; Rose, J.H. (Ames Laboratory, Iowa State Univ., Ames, IA). *Journal of Nondestructive Evaluation;* **5**: No. 2, 57-68(Jun 1985).

A new method for determining the size of flaws, such as cracks and voids, in structural materials is reported. The method is based on the observation that, for a wide class of flaws, the zeroes in the real and imaginary parts of the scattering amplitude occur at characteristic frequencies which depend on the flaw size. The method of reconstruction using the zeroes is simpler than the inverse Born approximation because the flaw sizes are extracted directly from the characteristic frequencies. The new method employs the same data input as the inverse Born algorithm and has certain common limitations. Following a theoretical treatment, experimental results are presented for a number of different types of flaws.

4208 Electronic Circuits And Devices

16486 **(AD-A—174015/8/XAB) Assessment of silicon-on-insulator technologies for VLSI (very large scale integration).** Tsaur, B.Y. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1986. 10p. (MS—7019). NTIS, PC A02/MF A01.

A high-performance, cost-effective silicon-on-insulator (SOI) technology would have important near-term applications in radiation-hardened electronics and longer-term applications in submicrometer VLSI. The advantages of SOI over bulk Si technology for these applications are outlined, and CMOS, CJFET, and bipolar device structures being developed for SOI are discussed. The current status and future prospects of the two most promising SOI technologies -- beam recrystallization and high-dose oxygen implantation -- are reviewed, with emphasis on such issues critical to commercialization as material quality and manufacturing feasibility.

16487 **(AD-A—174521/5/XAB) High power, millimeter-wavelength, coherent radiation sources. Final report, 1 February 1982-31 January 1986.** Walsh, J.E. (Dartmouth Coll., Hanover, NH (USA). Dept. of Physics and Astronomy). 25 Sep 1986. 72p. NTIS, PC A04/MF A01.

A summary of the results of the Cherenkov Maser development is presented. During the course of this work, operation over the spectral range extending from just below 30 GHz to just above 300 GHz was demonstrated. Sources based upon high-power microwave-tube technology and sources driven by pulse-power generators were both used to drive Cherenkov Masers. In the former type, 10% efficiency from single-pass, untapered resonators were obtained, while in the latter, efficiency was in the 0.1-1% range. Extensive computer codes describing linear and nonlinear aspects of Cerenkov Maser operation were also developed.

16488 (CONF-8412124—Exc., pp 7-19) **Energy from waste: Is it ecologically acceptable.** Schenkel, W. (Umweltbundesamt, Berlin, Germany, F.R.). Jun 1986. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

Abfallwirtschaft in Rheinland-Pfalz. No. 3.

The author reports on the emissions from waste incineration plants at the example of some hazardous substances in relation to coal firings. Cleaning methods as well as the treatment of waste products for refuse tips or their recycling are dealt with. Ecological points of view must be taken into consideration in accordance with the requirements of the individual cases.

16489 (CONF-8412124—Exc., pp 21-29) **Arguments against energy from waste.** Koch, T. (Institut fuer Energie- und Umweltforschung e.V., Heidelberg, Germany, F.R.). Jun 1986. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

Abfallwirtschaft in Rheinland-Pfalz. No. 3.

According to our present level of knowledge, an energetic utilization of waste products is primarily seen in recycling; the thermical utilization by incineration being only or secondary possibility. The pollution of the air is not likely to be reduced noticeably by operating a refuse-fueled heating power station with coupled district heating. A method of dioxin-free waste incineration does not exist with the present technical standards and cannot be found on the international markets. As for the problems related to dioxin the sciences are still in the beginnings. Presently, no limits of unhazardous emissions can be stated in a scientifically profound way without any doubts. Waste incineration plants are diametrically opposite the goals of raw material regaining. Their profitable operation depends on a quantity of waste products as constant as possible which is completely contrary to the absolute priority of waste management: avoiding waste products.

16490 **(KIYI—85-17) Device for digital data transmission by a coaxial cable.** Kisurin, V.A.; Berezin, F.N. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700829.

A set is described of CAMAC modules transmitter and receiver of identical structure for serial coded data exchange in multicomputer systems. Data transmission velocity is up to 125 Kword/s. The length of coaxial cable line is up to 0,5 km. 4 figs.

16491 **(LA-UR—86-4285) GaAs photoconductors to characterize picosecond response in GaAs integrated devices and circuits.** Hammond, R.B.; Paulter, N.G.; Gibbs, A.J. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 4p. (CONF-8608147—2). NTIS, PC A02/MF A01. File Number DE87003744.

From International conference on high-speed electronics; Stockholm, Sweden (7 Aug 1986).

Optoelectronic techniques that use femtosecond lasers and promise the precise measurement of transient response in high speed electronic devices and circuits have been under study for several years. We have investigated on-wafer electrical-impulse generation and sampling using femto-second-laser-excited GaAs photoconductors. This approach is applicable to any transmission line structure, it is directly integrable, non-invasive, jitter-free, and it is applicable to both microwave and digital circuits. We have developed the capability to: (a) generate electrical impulses in on-

wafer GaAs transmission lines with 3-dB bandwidths in excess of 60 GHz, and (b) sample the electrical impulse response of an on-wafer test structure without jitter and with a 3-dB measurement bandwidth of 103 GHz at a noise level of -67 dBm. We have studied dispersion in GaAs on-wafer coplanar-waveguide transmission lines.

16492 **(LA-UR—86-4286) Characterization of on-chip polycrystalline silicon photoconductors.** Fitzpatrick, D.K.; Bowman, D.R.; Hammond, R.B. (Los Alamos National Lab., NM (USA); Harris Semiconductor, Melbourne, FL (USA); Military Academy, West Point, NY (USA)). 1986. Contract W-7405-ENG-36. 5p. (CONF-8608147—). NTIS, PC A02/MF A01. File Number DE87003745.

From International conference on high-speed electronics; Stockholm, Sweden (7 Aug 1986).

We report experimental and modeling studies of on-ship photoconductor pulse generation and sampling. Specifically, we discuss (a) the effect of ion-beam damage on carrier lifetime and sampling-aperture time, (b) the circuit limits to pulse risetime, and (c) the room-temperature stability of ion-beam-damaged sampling gates.

16493 **(UCRL—94402) Integrated optical devices for high speed diagnostics.** McWright, G.M. (Lawrence Livermore National Lab., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 26p. (CONF-8604292—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87003160.

From Society of Photo-Optical Instrumentation advanced institute on broadband photonic sensors; Howey-in-the-Hills, FL, USA (7 Apr 1986).

The design, fabrication, and evaluation of high speed directional coupler waveguide modulators for application to diagnostic systems is discussed.

16494 **Log amplifier with pole-zero compensation.** Brookshier, W. (to Dept. of Energy, Washington, DC). US Patent 4,634,986. 6 Jan 1987. Filed date 8 Feb 1985. vp.

This patent describes a log amplifier responsive to an input signal current for developing an amplified output signal and characterized by poles and zeros which vary with the input signal amplitude, the log amplifier circuit comprising: a first operational amplifier having an input terminal to which the input signal current is provided and an output terminal at which a first voltage is developed; a first feedback network coupled between the input terminal of the first operational amplifier and an intermediate point and including a nonlinear log element across which a second voltage which varies with the input signal current is developed; and a second feedback network including a second inverting operational amplifier coupled between the output terminal of the first operational amplifier and the intermediate point. It is responsive to the first voltage for developing a compensation signal and applying the compensation signal to the first feedback network in generating a compensated feedback signal at the input terminal of the first operational amplifier.

16495 **Optical analog data link with simple self-test feature.** Witkover, R.L. (to Dept. of Energy, Washington, DC). US Patent 4,633,523. 30 Dec 1986. Filed date 1 Feb 1984. vp.

A communications circuit is described for optically transmitting analog data free of excessive ripple comprising a V/F converter having an input line for receiving an analog voltage signal from a source of voltage. The V/F converter has an output and is effective to produce a predetermined minimum carrier frequency at the output responsive to receipt of a zero voltage signal on the input line. An optical transmitter is connected to receive voltage pulses from the output and is operable to produce flashes of light at frequencies varying in proportion to variations in the frequency of the voltage pulses. An optical transmission link is connected to transmit the flashes of light and an optical receiver is connected to receive flashes of light from the transmission link and is operable to produce a chain of voltage pulses the frequency of which varies in proportion to variations in the frequency of the received flashes of light.

16496 **Computational modeling of plasma-flow switched foil implosions.** Lindemuth, I.R. (Los Alamos National Lab., Los Alamos, NM). pp 1R-4 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

Turchi has proposed a "plasma-flow" or "commutator" switch as a means of achieving high dI/dt in a radially imploding metallic foil plasma. In this concept, an axially moving foil provides the initial coaxial gun discharge path for the prime power source and provides an "integral" inductive storage of magnetic energy. As the axially moving foil reaches the end of the coaxial gun, a radially imploding load foil is switched into the circuit. The authors have begun two-dimensional computer modeling of the two-foil implosion system. The authors use a magnetohydrodynamic (MHD) model which includes tabulated state and transport properties of the metallic foil material. Moving numerical grids are used to achieve adequate resolution of the moving foils. A variety of radiation models are used to compute the radiation generated when the imploding load foil converges on axis. The authors' computations attempt to examine the interaction of the switching foil with the load foil. In particular, the authors examine the relationship between foil placement and implosion quality. The status of the authors' computational effort is reported.

16497 **Observation of high-power microwave emission from a virtual cathode device.** Davis, H.A.; Bartsch, R.R.; Sherwood, E.G.; Stringfield, R.M. (Los Alamos National Lab., Los Alamos, NM). pp 1B-1 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

The authors report on experiments to generate high-power microwave radiation using a virtual cathode device. In these experiments an electron beam (I=90kA, V=1-3MV, t=60ns) produced in an unmagnetized diode is injected, through a thin window, into circular waveguide such that a virtual cathode is expected to form. The one centimeter diameter cathode is centered in a 3.6 centimeter diameter rounded housing. The microwave radiation produced is transported along circular waveguide which flares to 60cm diameter for extraction into air. Fast response-time microwave detectors are used to measure the microwave output as function of time. Dispersive waveguide channels are used to carry out spectral analysis in the standard waveguide channels from 8 to 40Ghz. In the frequency band from 2 to 8Ghz spectral measurements are made with bandpass filters. Frequency coverage in the fast response-time channels is from 8 to 40 Ghz. Power measurements are made by integrating radiation profiles measured by scanning from shot-to-shot. Arrays of fluorescent tubes are used to make single shot time-integrated mode measurements. The following experimental configurations have been investigated: 1. Waveguide diameters of 6,12 and 20cm; 2:Anode-cathode gap spacings varying from 0.4 to 0.9cm; 3. Vacuum and gas filled waveguide; 4. A variety of anode foil types and cathode shapes.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 16498

4210 Combustion Systems

REFER ALSO TO CITATION(S) 15314, 15315, 15316, 15317, 16332, 16717

16498 (CONF-8412124—Exc., pp 31-39) **Pyrolysis and dumping: Are they alternatives to waste incineration.** Fuermaier, B. (Bayerisches Landesamt fuer Umweltschutz, Muenchen, Germany, F.R.). Jun 1986. (In German). NTIS (US Sales Only), PC A03. File Number DE87751306.

From Experts discussion on a waste management concept for the south western and southern Palatinate; Pirmasens, F.R. Germany (10 Dec 1984).

Abfallwirtschaft in Rheinland-Pfalz. No. 3.

In Germany, pyrolysis of municipal wastes is being tested in 2 pilot plants. As presently no data obtained under waste management conditions are available for both plants, an assessment is not possible. A refuse pit with untreated waste products still continues damaging the ecological system over decades after its closing which is due to seeping water and degasing. Furthermore, it heeps away from the ecological system utilizable substances (material recycling, energy recycling) which are completely buried forever. For rest material string, however, a pit is needed as no treatment and utilization method functions without residues. The residues should be in mineralized form (thermal treatment), however, in order to save the pit from uncontrolled decomposition processes and to be able to work in a volume-saving way.

16499 **(N—87-11858) User's manual for a TEACH computer program for the analysis of turbulent, swirling reacting flow in a research combustor.** Chiappetta, L.M. (United Technologies Research Center, East Hartford, CT (USA)). Sep 1983. 120p. (NASA-CR—179547; NAS—1.26:179547; R—83-915540-27). NTIS, PC A06/MF A01.

Described is a computer program for the analysis of the subsonic, swirling, reacting turbulent flow in an axisymmetric, bluff-body research combustor. The program features an improved finite-difference procedure designed to reduce the effects of numerical diffusion and a new algorithm for predicting the pressure distribution within the combustor. A research version of the computer program described in the report was supplied to United Technologies Research Center by Professor A. D. Gosman and his students, R. Benodeker and R. I. Issa, of Imperial College, London. The Imperial College staff also supplied much of the program documentation. Presented are a description of the mathematical model for flow within an axisymmetric bluff-body combustor, the development of the finite-difference procedure used to represent the system of equations, an outline of the algorithm for determining the static pressure distribution within the combustor, a description of the computer program including its input format, and the results for representative test cases.

16500 **(NP—7770048) Energy optimisation of industrial furnaces by optimum control.** Kohlgrueber, K. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 19 Dec 1984. 161p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87770048.

Process control of industrial furnaces is done on mathematical models from the energy point of view. This computer-aided optimisation process is first done on the mathematical model of an indirectly electrically heated experimental furnace (with individually controllable zones) in order to include a simple model furnace for solving this optimisation problem. An optimisation problem of the variation calculation is produced. Efficiencies are given, using the optimum control for minimum and maximum energy demand. In order to minimize the fuel and energy demand of continuous heating furnaces heated with fuel and operated in counterflow, a high temperature level should be aimed at the end of heating the contents, as in electric furnaces. It is proposed, based on the results of the investigation to use the ratio of the mass of material to the required mass of fuel, as well as the efficiency, for the assessment of furnaces heated with fuel. Optimum solutions are given for the stated heating times. (HWJ).

4230 Marine Engineering

16501 **(N—87-11750, pp vp) Structural optimization of large ocean-going structures.** Hughes, O.F. 1984. NTIS, PC A22/MF A01. (NASA-CP—2327-PT-2; L—15830; NAS—1.55:2327-PT-2; CONF-8404323—Pt.2).

From Symposium on recent experiences in multidisciplinary analysis and optimization; Hampton, VA, USA (24 Apr 1984).

Ocean-going vehicles and platforms are among the largest structures in the world and are subjected to relatively harsh conditions of motions and loads. Some of them, such as semi-submersible platforms, are a relatively new type of structure and hence there is no formal, well evolved and established structural design code as there is for more traditional structures. More recently, efforts have also been made to develop a design method of this type for ships and other ocean structures. One of the many advantages of a rationally based design method is versatility; it can be used for structures that have widely differing purposes, measures of merit, shapes and sizes. The purpose is to describe a rationally based design method that has been developed within the field of ocean structures, in order that persons dealing with other types of structure can judge whether and to what extent its various features may be useful for those other types. Also, even though some features may not be applicable they might stimulate some useful ideas.

4250 Power Cycles

REFER ALSO TO CITATION(S) 15737

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 16529

16502 **(ANL-HEP-CP—86-105) The ANL experiment for a wake field accelerator using an rf structure.** Ruggiero, A.G.; Schoessow, P.; Simpson, J. (Argonne National Lab., IL (USA)). 27 Aug 1986. Contract W-31-109-ENG-38. 20p. (CONF-8608123—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004945.

From Advanced accelerator concepts conference; Madison, WI, USA (21 Aug 1986).

Experiments are planned at ANL to study a new accelerating concept that has been developed during the last few years named the WAKEATRON. This requires a very special, simple configuration of the beams and of the rf structure involved. The basic concepts are explained. Like most proposed experimental work, this too was initiated by a considerable amount of computational work, both analytical and numerical, on which we would like to report. We will then describe details of the planned experiments we will carry out at ANL to check some of our predictions for this concept. These experiments concentrate on beam and cavity geometry applicable to the Wakeatron.

16503 **(ANL-HEP-CP—86-122) Extending the reach of the SSC [Superconducting Super Collider].** Diebold, R. (Argonne National Lab., IL (USA)). 1986. Contract W-31-109-ENG-38. 5p. (CONF-8606215—30). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004972.

From Summer study on the physics of the superconducting super collider ↑; 0.

The physics reach of the SSC can eventually be extended considerably by an increase in luminosity. New heavy particles and other phenomena with robust signatures would be readily identified even in the presence of large numbers of simultaneous background interactions. As an example, this note examines the case in which the number of protons per SSC bunch is increased by a factor of $\sqrt{10}$, while other parameters are held fixed at their CDR values, to give a luminosity of $10^{34}cm^{-2}sec^{-1}$. Impacts of the increased beam current on beam stability and the various subsystems are discussed. No fundamental problems have been found. While equivalent in some ways to a doubling of the energy, the costs of such a luminosity upgrade are small compared to the initial cost of the SSC. These costs are still substantial in absolute terms, however, especially in the area of cryogenic refrigeration. It is recommended that flexibility be built into the SSC to facilitate upgrades in a cost efficient manner.

16504 (BNL—51959, pp 1-14) **Construction and commissioning of the national synchrotron light source.** Galayda, J.N.; Blume, M. Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The road from conception to completion of a large facility like the National Synchrotron Light Source (NSLS) is a long and tortuous one. More than fifteen years have passed since the first discussions of a synchrotron radiation source at BNL, and there have been many twists and turns in the process. In putting together an accelerator project like this, there are many critical skills that must be assembled, and budgets, schedules and organizations must be properly examined. The lessons learned in design and commissioning of the NSLS rings may be summarized as follows: (1) the damped emittances expected of a Chasman-Green lattice are attainable at high current, if ion trapping problems can be circumvented; (2) there have been no unexpected effects from the rather strong sextupoles required to correct the chromaticities in this type of lattice; (3) the most important beam instabilities are coupled-bunch, and can be counteracted; and (4) commissioning the NSLS rings was mostly an effort to bring the hardware into conformation with the original ring design; achievement of the specified magnetic fields, injection timing, vacuum, RF voltages, etc. led to ring performance which was easily good enough to begin operation.

16505 (BNL—51959, pp 15-28) **Photon factory.** Tanaka, J.; Huke, K.; Chikawa, J. (National Lab. for High Energy Physics, Ibaraki, Japan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The Photon Factory (PF) was established on April 1, 1978 at KEK. The PF is a synchrotron radiation facility, which has a 2.5 GeV electron storage ring fully dedicated to the SR usage and a 2.5 GeV electron linac supplying electrons and positrons to the PF ring and the accumulation ring of TRISTAN (30 GeV electron-positron colliding machine). The PF consists of three departments, injector linac, light source, and instrumentation department. The facility is described.

16506 (BNL—51959, pp 175-187) **ISSP-KEK new light source project.** Takehiko, I.; Goro, I. (Univ. of Tokyo, Japan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The construction of a 1.0 GeV storage ring with 10 to 13 straight sections for insertion devices is planned as a joint project of the Institute for Solid State Physics, the University of Tokyo and the National Laboratory for High Energy Physics. The outline of the project and some aspects of the light source are described.

16507 (CEA-CONF—8529) **Feedback system analysis for beam breakup in a multipass multisection electron linac.** Mosnier, A.; Aune, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Jun 1986. 4p. (CONF-860629—61; CEA-DPH-N-S—2351-3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750466.

From Linear accelerator conference; Stanford, CA, USA (2 Jun 1986).

A recirculating electron accelerator based upon superconducting cavities technology is envisaged in different laboratories to produce a high duty cycle beam with energy in the GeV region. Beam break up is a severe limitation in this kind of accelerator due to the positive feedback of the returning beams. We present here an analysis based upon feedback system theory which takes into account the different cavities of the linac, the optics of the linac and of the recirculating path. An example is given for the Saclay proposal of a 2 GeV accelerator consisting of 4 passes in a 500 MeV, 100 m-long superconducting linac.

16508 (CONF-8611103—6) **ATLAS accelerator laboratory report.** Den Hartog, P. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004695.

From 20. symposium of North Eastern Accelerator Personnel ↑; 0.

The operation of the ATLAS Accelerator is reported. Modifications are reported, including the installation of conductive tires for the Pelletron chain pulleys, installation of a new high frequency sweeper system at the entrance to the linac, and improvements to the rf drive ports of eight resonators to correct failures in the thermally conductive ceramic insulators. Progress is reported on the positive-ion injector upgrade for ATLAS. Also reported are building modifications and possible new uses for the tandem injector. (LEW)

16509 (INIS-mf—10558, pp 31) **Recent developments in the multipurpose intense 14 MeV neutron source at Bratislava.** Pivarc, J.; Hlavac, S.; Oblozinsky, P.; Matousek, V.; Lorencz, R.; Turzo, I.; Dostal, L. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

16510 (KIYI—85-21) **Problems and perspectives of the U-240 control system development.** Sakhno, V.I. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700831.

The main problems of construction of automated control system for the 240-cm isochronous cyclotron are stated. The structures are shown of the control system, constructed according to the module principle and guaranteeing the control and calculation functions of division. The main principles and procedure of cyclotron control are presented. 7 refs.; 4 figs.

16511 (KIYI—85-22) **Software of the module of automatic control system by power supply of the U-240 cyclotron.** Sokolova, N.A. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700832.

A specialized programme for microelectronic computer Electronics-60M is described for the module of control by power supply sources of cyclotron automatic control system. The possibility of module work is forseen in information and in control condition. The control programme and service subprogrammes have been have been written in macroassembler language. 1 ref.

16512 (KIYI—85-23) **Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron.** Dem'yanov, A.V.; Linev, A.F.; Olejnik, E.E.; Sarkisyan, L.A.; Tulinov, A.F.; Chernyshenko, T.A. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 22p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700833.

The problems were discussed connected with the increase of proton energy from 80 MeV (240-cm cyclotron, Institute for Nuclear Research, the Ukrainian Academy of Sciences) to 850 MeV at ring cyclotron. H/sup -/ ion acceleration and its extraction based on a charge exchange in the first cyclotron and also the use of the beam extraction in high energy ring cyclotron based on the integral resonance on free radial oscillations alows to say about the medium beam currents equal to approximately 100-500 μA. Such acceleration complex may be considered as a prototype of a neutron generator where the technological process may be investigated and worked out, which are connected with electronuclear breeding. 11 refs.; 5 figs.

16513 (LA-UR—86-2243) **High-brightness rf linear accelerators.** Jameson, R.A. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 33p. (CONF-860756—7). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005133.

From NATO advanced course on high brightness accelerators; Pitlochry, Scotland (13 Jul 1986).

The issue of high brightness and its ramifications in linacs driven by radio-frequency fields is discussed. A history of the RF

linacs is reviewed briefly. Some current applications are then examined that are driving progress in RF linacs. The physics affecting the brightness of RF linacs is then discussed, followed by the economic feasibility of higher brightness machines. (LEW)

16514 **(NIIEFA-P-D—0637) Reliability of high-voltage electron accelerators.** Al'bertinskij, B.I.; Svin'in, M.P.; Tsepakin, S.G. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1984. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700842.

Reliability of high-voltage electron accelerators may be evaluated taking account of the general reliability theory. It's main reliability factors are failure interval and utilization rate. At the stage of accelerator designing normalization of these factors, comparative evaluation of accelerator layout variants and use of different elements, reliability calculations for redundant systems are carried out; duration of life testings are determined too. Statistical data obtained during accelerator operation allowed to estimate reliability of operating accelerators, to augment reliability of designed separate units and accelerators on the whole, as well as to determine ways of their further reliability augmentation. 17 refs.

16515 **(NIIEFA-P-V—0684) Experimental study of two-beam resonator accelerator in a pulse mode.** Bel'skij, N.P.; Vorogushin, M.F.; Zvyagin, V.V.; Korobov, V.I.; Mudrolyubov, V.G.; Skrydlyak, I.S. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700847.

The results of experimental study of a pulse resonator accelerator with modulated beam excitation are presented. The main accelerator unit is a transforming resonator of complex form excited at the second azimuthal-symmetric type of oscillations, at that the accelerated and exciting beams crossing the gap respectively in the first and second antinodes of HF electric field. The two-beam scheme efficiency is determined by the resonator geometry and by the conditions of shaping and deceleration of auxiliary beam. In case of resonator unit excitation from external generator of 1.5 kW the following parameters are obtained: transformation coefficient approximately 80; excitation efficiency approximately 80%; excitation power 35 kW in the pulse of 300 μs duration at the repetition rate up to 6 Hz. Maximum energy of electron accelerated beam is 400 keV at pulse current of 20 mA. 2 refs.; 12 figs.

16516 **(SLAC-PUB—4179) Unique radiation problems associated with the SLAC Linear Collider.** Jenkins, T.M.; Nelson, W.R. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Jan 1987. Contract AC03-76SF00515. 22p. (CONF-870219—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004898.

From Midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

The SLAC Linear Collider (SLC) is a variation of a new class of linear colliders whereby two linear accelerators are aimed at each other to collide intense bunches of electrons and positrons together. Conventional storage rings are becoming ever more costly as the energy of the stored beams increases such that the cost of two linear colliders per GeV is less than that of electron-positron storage rings at cm energies above about 100 GeV. The SLC being built at SLAC is designed to achieve a center-of-mass energy of 100 GeV by accelerating intense bunches of particles, both electrons and positrons, in the SLAC linac and transporting them along two different arcs to a point where they are focused to a small radius and made to collide head on. The SLC has two main goals. The first is to develop the physics and technology of linear colliders. The other is to achieve center-of-mass energies above 90 GeV in order to investigate the unification of the weak and electromagnetic interactions in the energy range above 90 GeV; (i.e., Z^0, etc.). This note discusses a few of the special problems that were encountered by the Radiation Physics group at SLAC during the design and construction of the SLAC Linear Collider. The nature of these problems is discussed along with the methods employed to solve them.

16517 **Study of neutron leakage through an Fe shield at an accelerator.** Elwyn, A.J.; Cossairt, J.D. (Fermi National Accelerator Lab., Batavia, IL). *Health Physics;* No. 6, 723-735(Dec 1986).

The spectrum of neutrons, produced in the interactions of hadrons with energies up to several hundred GeV, that are emitted through a large Fe electro magnet has been determined by use of a multisphere spectrometer both before and after the shielding was augmented with concrete. The existence of leakage neutrons at energies of approximately 0.005-1.0 MeV was verified in the initial configuration, and found to be completely eliminated in the spectrum obtained after the concrete was added. The quality factor of the radiation field was measured; the values are reduced from about six to three with the extra shielding. Additional fluence measurements in the environs of the magnet can be interpreted in terms of a skyshine mechanism with source and attenuation parameters consistent with the energies and intensity of the leakage neutrons.

16518 **Neutron shields for medium-energy accelerators.** Morford, R.J.; Carter, L.L. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society;* 53: 410-412(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The purpose of this work was to support the design of neutron shields for medium-energy accelerators using neutron transport codes and high-energy cross-section sets. In addition, an estimate was made of the effect of conservatism on facility cost, and thus the incentive to reduce uncertainty associated with the analyses.

16519 **The tevatron energy doubler: A superconducting accelerator.** Edwards, H.T. (Fermi National Accelerator Lab., Batavia, IL). pp 605-660 of Annual review of nuclear and particle science. Volume 35. Jackson, J.D.; Gove, H.E.; Schwitters, R.F. Palo Alto, CA; Annual Reviews Inc. (1985).

The Energy Doubler was commissioned between June and September of 1983. Beam was first accelerated in July to 512 GeV. Fixed-target operation at 400 GeV began in October 1983 and the energy was increased to 800 GeV in February 1984. At this writing there have been three physics runs over a total of about 12 months duration, so one can begin to make some generalizations about the operational behavior of the accelerator. The three runs were at 400, 800, and 800 GeV with fast extraction. Intensity to date has not exceeded 1.1 x 10/sup 13/ ppp. Single-beam storage studies have been carried out. The rapid commissioning was successful probably because of the many step-by-step tests of components and subsystems that were made over the years prior to the final beam test. Though the major systems were not particularly reliable, they were all checked out and working. Interruptions to beam studies were at the level of trips of the ramp caused by refrigerator instabilities or spurious quenches caused by the quench protection system rather than any basic flaws.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 16507, 16571, 16590

16520 **(BARC—1256) RF-phase measurement and optimization for the Variable Energy Cyclotron, Calcutta.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701251.

For improving the beam quality in a cyclotron it is necessary that the radio frequency phase of the internal beam be optimized. For this purpose the phases have been measured by two techniques, viz., the Smith-Garren procedure and the prompt gamma method at various radii. A prompt gamma setup has been developed and installed at the Variable Energy Cyclotron, Calcutta. The measured phases have been used to find out the changes in the currents of various trim coils. A procedure for minimizing the phases has been given and the first results have been discussed. 7 refs., 11 figures.

16521 **(CNIC—00009) Application of graphical design method to beam transport system.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 14p. (In Chinese). (IAE—0009). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701279.

A graphical design method in which a partical beam with initial divergence can realize waist to waist transport in both X and Y planed simultaneously by means of quadrupole doublet is presented. Graphical mathod and transport matrix as well as charts can be used so that a quick design can be carried out to save computer time considerably. A concrete example of the beam is given to demonstrate the practical application of the theory mentioned above.

16522 **(DOE/ER/40124—12) Beam dynamics calculations for the linac booster beam line.** Lu, J.Q.; Cramer, J.G.; Storm, D.W. (Washington Univ., Seattle (USA). Nuclear Physics Lab.). [1987]. Contract AC06-84ER40124. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005551.

Beam optics focusing characteristics both in the transverse and longitudinal directions of the superconducting linac booster beam line are calculated for different particles. Three computer programs, which are TRANSPORT, LYRA and ENTIME, are used to simulate particle motions. The first one is used to simulate the particle radial motions. The effects of energy increase on to the transverse phase space area are considered by putting in accelerating matrices of each resonators. The second program is used to simulate particle longitudinal motions. Beam longitudinal motions are calculated with program ENTIME also, with which visual pictures in the Energy-Time phase space can be displayed on the terminal screen. Besides, the stability of the particle periodic motions in the radial directions are considered and calculated.

16523 **(EFI—777(4)-85) Phase velocity of wave in irregular waveguide in problems of synthesis.** Azizbekyan, G.V. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700673.

The problems related to the choice of phase velocity of waves in irregular waveguides when solving the problems of synthesis that allow to determine the waveguide geometric parameters by the given output parameters of a charged particle beam in waveguide electron and proton accelerators or the output power of the electromagnetic radiation field in travelling wave generators and amplifiers are considered. Phase coefficients of the waves of the effective electromagnetic field, which is the sum of the field excited by the beam and the generator field, are determined. The expressions obtained for the phase velocity of waves in a waveguide allow estimates for limiting values of radiation currents and rates. 6 refs.

16524 **(IFVE-OI—85-185) Systematic errors in field measurements in a hf quadrupole focusing accelerator.** Barsukov, A.B.; Belyaev, O.K.; Igoshin, V.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700716.

The paper presents the results on verification of the constant error correction formulas for the perturbation method of electromagnetic field measurement in the accelerating structure with RF quadrupole focusing. Plots of frequency perturbation distribution, both experimental and estimated ones are given. The method of error correction is described and the estimation of an accidental error is given. 10 refs.; 8 figs.; 1 tab.

16525 (INIS-SU—370, pp 26-29) **Manifestation of sleeping-instability in partially-compensated relativistic electron beams.** Karbushev, N.I.; Rukhadze, A.A.; Udivichenko, S.Yu. (AN SSSR, Moscow. Inst. Obshchej Fiziki). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Problem of sleeping-instability in partially-compensated relativistic electron beam is exactly solved for the ring waveguide. Nonuniformity of beam velocity is conditioned by electrostatic potential sagging.

16526 **(JINR—9-85-769) On tolerances for random perturbations of accelerating electric field in the KUTI-20 induction accelerating system (LUEhK-20).** Kazarinov, N.Yu.; Kazacha, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700766.

For the KUTI-20 induction accelerating system (LUEhK-20) the correlation functions of random processes connected with fluctuations of the main parameters of the accelerating electric field Esub(z) forming system are determined. These are the peak value of accelerating voltage on gaps, the shift of the inductor as a unite, the shift of gaps inside the inductors and the axial dimensions of the gaps. Permissible values of their spread required for the self-focusing electron-ion ring stable acceleration in electric and guiding magnetic fields are determined. It is shown that the spread of the magnetic system parameters exerts a decisive influence on the formation of dipole oscillations in the accelerating electron-ion ring. It is also shown that the tolerances on the spread of Esub(z) forming system parameters proved to be by two orders less rigid than tolerances on the magnetic system parameters and can be easily realized. 3 refs.; 3 figs.

16527 **(JINR-R—11-85-766) Quadrupole lense field potential determination by the boundary integral equation method.** Akopyan, V.P.; Sarkisyan, G.Kh.; Smirnova, L.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700813.

Numerical method for investigating the effect of small disturbances in quadrupole magnetic lense piece configuration on the field potential is proposed. The problem of field potential determination is reduced to a boundary integral equation. The method of the obtained equation discretization is considered. The dimensions of the piece stepwise surface are determined by the nongradient method of slipping tolerance. The results of numerical calculations are presented. 7 refs.; 2 tabs.; 2 figs.

16528 **(LA-UR—86-3643) Factors limiting the operation of structures under high gradient.** Schriber, S.O. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860629—68). NTIS, PC A02. File Number DE87005132.

From Linear accelerator conference; Stanford, CA, USA (2 Jun 1986).

Factors limiting the operation of rf structures under high-gradient conditions are described. Included are recent rf measurements at laboratories in Europe, Asia, and North America and how these measurements relate to earlier data as exemplified by the use of the Kilpatrick criterion (Kp). Operation limitations will cover mechanical, geometry, thermal, and surface constraints and the associated impact on structure design, fabrication, and material selection. Generally, structures operating continuous wave (100% duty factor) appear to be limited to peak surface fields at about twice the Kilpatrick limit, whereas pulsed structures operating with pulse lengths less than a millisecond can attain peak surface fields five times the Kilpatrick limit.

16529 **(LAL-RT—85-16) High field electron linacs.** Le Duff, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Dec 1985. 22p. (CONF-8509330—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750450.

From CERN accelerator school; Oxford, UK (16 Sep 1985).

High field electron linacs are considered as potential candidates to provide very high energies beyond LEP. Since almost twenty years not much improvement has been made on linac technologies as they have been mostly kept at low and medium energies to be used as injectors for storage rings. Today, both their efficiency and their performances are being reconsidered, and for instance the pulse compression sheme developed at SLAC and introduced

to upgrade the energy of that linac is a first step towards a new generation of linear accelerators. However this is not enough in terms of power consumption and more development is needed to improve both the efficiency of accelerating structures and the performances of RF power sources.

16530 **(NIIEFA-P-E—0665) TOREX program for calculating aberration coefficients of magnetooptical systems.** Nagaenko, M.G. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700843.

Description of the TOREX program for computer-aided design of aberration coefficients of the 2nd and 3rd order of magnetooptical cyclic accelerator systems, transport channels and charged particle beam shapers is given. Calculation of aberration coefficients is based on the method of trajectory tracing using differential approximations of high accuracy differential operators. The program is executed on the FORTRAN-4 applically to the ES-computer. 3 refs.

16531 **Gas-phase photoemission with soft x-rays: Cross sections and angular distributions.** Shirley, D.A.; Kobrin, P.H.; Truesdale, C.M.; Lindle, D.W.; Ferrett, T.A.; Heimann, P.A.; Becker, U.; Kerkhoff, H.G.; Southworth, S.H. (Materials and Molecular Research Div., Lawrence Berkeley Lab., and Dept. of Chemistry, Univ. of California, Berkeley, CA 94720). pp 150-156 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—). Contract AC03-76SF00098.

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

A summary is presented of typical gas-phase photoemission studies based on synchrotron radiation in the 50-5000 eV range, using beam lines at the Stanford Synchrotron Radiation Laboratory. Three topics are addressed: atomic inner-shell photoelectron cross sections and asymmetries, correlation peaks in rare gases, and core-level shape resonances in molecules. Photoelectron cross-section σ(n iota) and asymmetry-parameter β(n iota) studies in mercury vapor at photon energies up to 270 eV (up to 600 eV for β/sub 4f/) extend coverage of these parameters to n≦5 and iota≦3. Comparison with Dirac-Slater and relativistic random-phase approximation calculations reveals systematic discrepancies. For example, distinct Cooper minima in σ(n iota) are observed but not predicted, while predicted β(n iota) values are typically too high. Correlation satellites have been studied for the K shells of helium ($h\nu$ = 68-90 eV), neon ($h\nu$ = 870-960 eV) and argon ($h\nu$ = 3200-3320 eV). In helium the n=2 satellite peak was shown to have mainly 2p character at threshold, and its asymmetry was measured through the autoionizing resonance region. Tentative evidence was obtained that the neon satellites are less intense near threshold than in the high-energy limit, and that their intensities stay constant or decrease with increasing energy near threshold. A new satellite was observed in argon at 24.6 eV which appears to increase in intensity with energy. Molecular core-level shape resonances were observed for the first time by photoemission, yielding $\sigma(h\nu)$ and $\beta(h\nu)$ for core levels from 180 eV binding energy (S 2p in SF/sub 6/ and OCS) through C 1s in CO, CO/sub 2/ and CF/sub 4/, N 1s in N/sub 2/ and NO, and O 1s in CO and CO/sub 2/ to 2490 eV (S 1s in SF/sub 6/). Several conclusions can be drawn about the photoelectron and Auger cross sections and asymmetry parameters.

16532 **Optimum undulator trajectories.** Tatchyn, R. (Stanford Synchrotron Radiation Lab. and Stanford Electronics Labs., Stanford Univ., 421 McCullough, Stanford, CA 94305). pp 16-22 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—).

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

The undulator is a machine that induces amplitude fluctuations in normally-rectilinear electron trajectories, causing coherently-reinforced radiation to appear along the direction of electron motion. Presently, such machines operate on electrons travelling in straight sections of synchrotron rings. The inherently large number of variable characterizing the undulator-electron interaction makes it difficult to identify the principal parameters for optimization when designing synchrotron rings dedicated to undulator operation. The results are presented of a variational analysis of the equation describing undulator radiation. In particular, the results identify the optimum electron trajectories in undulators, in the sense of maximizing the intensity of the emitted radiation in the forward direction, and establish the optimum amplitudes of the electron motion. These important results are presented in terms of the total electron velocity, βc, and the average on-axis velocity β*c. The results, besides providing a valuable insight into undulator operation, rigorously establish the principal optimization parameters for associated synchrotron ring design.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 16519, 16521, 17312

16533 **(BNL—38938) Design considerations for a combined synchrotron-light source and heavy-ion storage ring Atomic Physics Facility.** Jones, K.W.; Johnson, B.M.; Meron, M.; Lee, Y.Y.; Thieberger, P.; Thomlinson, W.C. (Brookhaven National Lab., Upton, NY (USA)). 10 Nov 1986. Contract AC02-76CH00016. 34p. (CONF-861114—44). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005251.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

An Atomic Physics Facility (APF) based on the combination of photons produced by a synchrotron light source with heavy ions in a storage ring will open the way to the study of ionic states of almost all elements. The design considerations for such a facility are discussed in terms of the use of synchrotron radiation for photoexcitation and ionization experiments. Design considerations for an APF are given in terms of the accelerator facilities presently available at BNL which include the National Synchrotron Light Source and Tandem Van de Graaff Laboratory. The results show that the concept is valid and therefore that implementation would result in entirely new capabilities for the study of multiply-ionized atoms.

16534 **(BNL—39105) Trace element measurements using white synchrotron radiation.** Hanson, A.L.; Jones, K.W.; Gordon, B.M.; Pounds, J.G.; Kwiatek, W.M.; Long, G.J.; Rivers, M.L.; Sutton, S.R. (Brookhaven National Lab., Upton, NY (USA); Chicago Univ., IL (USA). Dept. of Geophysical Sciences). 10 Nov 1986. Contract AC02-76CH00016. 21p. (CONF-861114—46). NTIS, PC A02. File Number DE87005244.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Synchrotron radiation, when used for x-ray fluorescence (XRF) has several advantages over conventional x-ray sources. Our group at Brookhaven National Laboratory is developing the equipment and expertise to make XRF measurements with synchrotron radiation. The apparatus is briefly described, along with the alignment techniques. Some minimum detectable limits for trace elements in thin biological standards measured with white light irradiations are presented.

16535 **(BNL—39109) Applications of synchrotron x-ray fluorescence to extraterrestrial materials.** Sutton, S.R.; Rivers, M.L.; Smith, J.V. (Brookhaven National Lab., Upton, NY (USA); Chicago Univ., IL (USA). Dept. of Geophysical Sciences). 1986. Contract AC02-76CH00016. 18p. (CONF-861114—45). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005243.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Synchrotron x-ray fluorescence (SXRF) is a valuable technique for trace element analyses of extraterrestrial materials permitting minimum detection limits less than 1 ppM for 20 micrometer spots. SXRF measurements have been performed on iron meteorites and micrometeorites using white synchrotron radiation and an

energy dispersive x-ray detector at the National Synchrotron Light Source (X-26C), Brookhaven National Laboratory (NY). Partitioning of Cu between troilite (FeS) and metal in the nine iron meteorites studied suggests sub-solidus re-equilibration in these objects. A technique has been developed for determining self-absorption corrections for filtered, continuum excitation of small specimens, such as stratospheric particles and refractory inclusions in meteorites.

16536 **(CEA-CONF—8531) Interaction of GeV heavy ions with solids-first results at GANIL.** Dural, J.; Jousset, J.C.; Balanzat, E.; Toulemonde, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 10p. (CONF-8606101—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750460.

From 5. international conference on ion beam modification of materials; Catania, Italy (9 Jun 1986).

The Grand Accelerateur National d'Ions Lourds (GANIL) of CAEN, France accelerates ions from C to U in the energy range from 100 MeV/amu to 10 MeV/amu. The Centre Interdisciplinaire de Recherches avec les Ions Lourds (CIRIL) is in charge of the non nuclear facilities and assists, at GANIL, the physicists of both fields atomic physics and condensed matter physics. Irradiation facility and first typical results for condensed matter physics are presented.

16537 **(CNIC—00005) Surface ionization ion source with high current.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 10p. (In Chinese). (IAE—0005). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701275.

The working principle and structure of a surface ionization ion source with high current is described systematically. Some technological keypoints of the ion source are given in more detail, mainly including: choosing and shaping of the material of the surface ionizer, heating of the ionizer, distributing of working vapour on the ionizer surface, the flow control, the cooling problem at the non-ionization surface and the ion optics, etc. This ion source has been used since 1972 in the electromagnetic isotope separator with 180 deg angle. It is suitable for separating isotopes of alkali metals and rare earth metals. For instance, in the case of separating Rubidium, the maximum ion current of Rbsup(+) extracted from the ion source is about 120 mA, the maximum ion current accepted by the receiver is about 66 mA, the average ion current is more than 25 mA. The results show that our ion source have advantages of high ion current, good characteristics of focusing ion beam, working stability and structure reliability etc. It may be extended to other fields. Finally, some interesting phenomena in the experiment are discussed briefly. Some problems which should be investigated are further pointed out.

16538 **(CONF-860939—2) Thin film coatings which inhibit spin relaxation of polarized potassium atoms.** Thomas, G.E.; Holt, R.J.; Boyer, D.; Green, M.C.; Kowalczyk, R.S.; Young, L. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004715.

From 13. world conference of the Nuclear Target Development Society; Chalk River, Canada (17 Sep 1986).

A prototype of a polarized deuterium target which employs the spin exchange method is being developed. The mixing cell for mixing deuterium atoms and potassium vapor requires a surface that will reflect these atoms without being destroyed by the corrosive potassium. Thin film coating methods and a technique for coating pyrex are described. Results of spin relaxation measurements are given. (LEW)

16539 **(CONF-861114—39) Scientific opportunities at the proposed 6-7 GeV Advanced Photon Source.** Shency, G.K.; Viccaro, P.J. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004683.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Two different types of insertion devices - undulators and wigglers - have been developed to satisfy the many present and future requirements of various investigations using synchrotron radiation. The characteristics of the radiation from the Advanced Photon Source at Argonne are summarized, including the insertion device sources, source size and brilliance, and spectral character of the wiggler and undulator sources. Possible applications of the source are also given. (LEW)

16540 **(CONF-861114—40) Development of a polarized deuterium target by spin exchange with optically pumped K.** Young, L.; Holt, R.J.; Green, M.C.; Kowalcyzk, R.S. (Argonne National Lab., IL (USA)). Nov 1986. Contract W-31109-ENG-38. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004686.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

The development of a polarized internal target at an electron store ring is of great interest for studies in nuclear physics. The deuterium nuclei acquire polarization via the hyperfine interaction after electron spin exchange with optically pumped potassium vapor. A high power laser which covers the entire doppler width and hyperfine splitting of the ^{2}S/sub 1/2/ - ^{2}P/sub 1/2/ transition in potassium has been developed. Spin relaxation rates for potassium on various wall coatings have been measured. A dri-film surface has been shown to preserve polarization (>100 bounces), be long-lived at elevated temperatures, and to be efficient at preventing deuterium recombination.

16541 **(CONF-861114—53) The ATLAS Positive-Ion Injector project.** Pardo, R.C.; Bollinger, L.M.; Shepard, K.W. (Argonne National Lab., IL (USA)). 10 Nov 1986. Contract W-31109-ENG-38. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004754.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

The goal of the Argonne Positive Ion Injector project is to replace the ATLAS tandem injector with a facility which will increase the beam currents presently available by a factor of 100 and to make available at ATLAS essentially all beams including uranium. The beam quality expected from the facility will be at least as good as that of the tandem based ATLAS. The project combines two relatively new technologies - the electron cyclotron resonance ion source, which provides high charge state ions at microampere currents, and RF superconductivity which has been shown to be capable of generating accelerating fields as high as 10 MV/m, resulting in an essentially new method of acceleration for low-energy heavy ions.

16542 **(CONF-8609234—1) Progress on the IPNS Enriched Uranium Booster Target.** Knox, A.E.; Carpenter, J.M.; Bailey, J.L.; Armani, R.J.; Blomquist, R.N.; Brown, B.S.; Henley, D.R.; Hins, A.G.; Loomis, B.A.; Schulke, A.W. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 35p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004846.

From International collaboration on advanced neutron sources ↑; 0.

We describe the Enriched Uranium Booster Target designed for use in Argonne's Intense Pulsed Neutron Source. This report contains a general description of the system, and descriptions of the thermal-hydraulic and loss-of-coolant accident analyses, of the neutronic, criticality and power density calculations, of the assessment of radiation and thermal cycling growth, and of the disk fabrication methods. We also describe the calculations of radionuclide buildup and the related hazards analysis and our calculations of the temperature and stress profiles in the disks, and briefly allude to considerations of security and safeguards.

16543 **(DOE/ER/40124—10) A 300 kV isolation platform at the University of Washington.** Harper, G. (Washington Univ., Seattle (USA). Nuclear Physics Lab.). 1986. Contract AC06-84ER40124. 5p. (CONF-8611103—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003132.

From 20. symposium of North Eastern Accelerator Personnel ↑; 0.

An isolated platform for the voltage elevation of ion sources used by the Nuclear Physics Laboratory at the University of Washington has been built and its installation is nearing completion. This

report describes the purpose, major components, presents status, and future plans of the platform project.

16544 **(EFI—776(3)-85) Calculation and modelling of electron channel with a beam small angular divergence.** Danagulyan, S.S. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700672.

The algorithm for calculation and optimization of parameters of the Erevan synchrotron electron channel is described. The beam parameters are calculated by the Monte Carlo method. The effects of experimental factors on final particle distribution are discussed. Coordinate, angular and momentum distributions of particles in a beam are presented. Mean values of a beam angular divergence are 0.05 and 0.03 mrad in horizontal and vertical planes correspondingly. 7 refs.; 11 figs.

16545 **(EFI—779(6)-85) Erevan accelerator with a beam small angular divergence.** Avakyan, R.O.; Agaronyan, A.V.; Avetisyan, A.Eh. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700674.

A channel with a beam small angular divergence designed for experiments on the investigation of interactions of high energy electrons with single crystals is described. Characteristics of the channel main components are presented. Results of the beam profile measurements are compared to those of computer calculations. The electron beam divergence is estimated to be 5 x 10/sup -5/ rad. 7 refs.; 3 figs.

16546 **(EFI—784(11)-85) Data acquisition and storage system for the e-A experimental setup on the basis of the Ehlektronika-60 microcomputer.** Arutyunyan, V.N.; Badalyan, G.V.; Zograbyan, G.G.; Melikov, G.I.; Pasoyan, O.I.; Pogosov, V.S.; Shatyan, S.A.; Ehlbakyan, E.G. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700678.

A system for acquisition and storage of information from (Δ E, E) telescopes of silicon semiconductor detectors being a part of the "e-A" experimental setup used on the Erevan electron synchrotron internal beam which is designed for the spectrometry of heavy charged particles is described. The software performing the information storage, the calibration of spectrometric tracts, the periodical control of measurements as well as preliminary calculations allowing to obtain quickly some measurement results is described. The system is tested on the accelerator beam. 4 refs.; 2 figs.

16547 **(EFI—790(17)-85) Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron.** Agababyan, K.Sh.; Adamyan, F.V.; Ajrapetyan, A.V. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 32p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700682.

The experimental method for measuring the asymmetry of the γd -> pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron is described. The results of Monte Carlo calculations, the calibration of apparatus, the procedure of measurements and experimental data processing are repored. 26 refs.; 15 figs.; 2 tabs.

16548 **(EFI—793(20)-85) Characteristics of the Erevan synchrotron extracted electron e/sup -//sub 4/beam.** Bagdasaryan, D.S.; Boyakhchyan, E.M.; Kazaryan, G.B.; Karibyan, M.D.; Markaryan, Eh.R.; Mkrtchyan, G.G. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1984. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700684.

Characteristics of the electron beam used in experiments on particle electroproduction are reported. The scheme of beam formation, transport and parameters control as well as methods of measuring its characteristics are described. 6 refs.; 6 figs.

16549 **(FNAL/C—86/156) Shielding design at Fermilab: Calculations and measurements.** Cossairt, J.D. (Fermi National Accelerator Lab., Batavia, IL (USA)). Nov 1986. Contract AC02-76CH03000. 18p. (CONF-870219—6). NTIS, PC A02/MF A01. File Number DE87003854.

From Midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

The development of the Fermilab accelerator complex during the past two decades from its concept as the "200 BeV accelerator" to that of the present tevatron, designed to operate at energies as high as 1 TeV, has required a coincidental refinement and development in methods of shielding design. In this paper I describe these methods as used by the radiation protection staff of Fermilab. This description will review experimental measurements which substantiate these techniques in realistic situations. Along the way, observations will be stated which likely are applicable to other protron accelerators in the multi-hundred GeV energy region, including larger ones yet to be constructed.

16550 **(FNAL-TM—1436) Fermilab Central Computing Facility: Energy conservation report and mechanical systems design optimization and cost analysis study.** Krstulovich, S.F. (Fermi National Accelerator Lab., Batavia, IL (USA)). 12 Nov 1986. Contract AC02-76CH03000. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005562.

This report is developed as part of the Fermilab Central Computing Facility Project Title II Design Documentation Update under the provisions of DOE Document 6430.1, Chapter XIII-21, Section 14, paragraph a. As such, it concentrates primarily on HVAC mechanical systems design optimization and cost analysis and should be considered as a supplement to the Title I Design Report date March 1986 wherein energy related issues are discussed pertaining to building envelope and orientation as well as electrical systems design.

16551 **(FNAL-TM—1437) Deflection analysis for an SSC [Superconducting Super Collider] dipole magnet with two external supports.** Nicol, T.H. (Fermi National Accelerator Lab., Batavia, IL (USA)). 9 Jan 1987. Contract AC02-76CH03000. 13p. NTIS, PC AA02/MF A01; 1; GPO Dep. File Number DE87005563.

SSC dipole magnets are presently supported at five mounting locations coincident with the internal cold mass supports. There is growing interest in reducing the number of external supports from five to two for reasons of simplified installation and alignment and as a cost reduction measure. This reports examines the placement of two external supports required to minimize the deflection of the cold mass assembly.

16552 **(IFVE-OI—85-134) HF-field stabilization in the booster injector debuncher.** Mal'tsev, I.G.; Nagaev, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700715.

The paper deals with problems of the HF-field stabilization in the booster injector debuncher. The debuncher is the two-gap coaxial resonator working at the 148.5 MHz frequency. Requirements to HF-field stability are determined. The HF-field perturbations by beam loading are estimated. Investigations have shown

that the HF-field perturbations depend strongly on electric length of feeder on direct connection of generator with debuncher. A method of choice of regime parameters is selected to stabilize the field in debuncher. The essence of the method is that at several regimes of the final amplifier tubes and parameters of its connection with resonator the generator adds power automatically, corrects the phase and field amplitude in resonator changing under the effect of the beam. Conclusion is made that for stabilization of the field amplitude in debuncher the phase lengths of feeder close to $\pi/2(1+p)$ where p=0,1,2,... is the most admissible one. 4 refs.; 5 figs.; 1 tab.

16553 **(IFVE-OKU—85-23) High-intensity proton beam formed onto internal target of the IHEP accelerator.** Ado, Yu.M.; Aseev, A.A.; Grishin, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700717.

A new mode of proton beam extraction with intensity up to 3 x 10/sup 10/ ppp has been investigated and realized at the IHEP accelerator. The beam is formed by the elastic scattering of the accelerated proton beam onto the internal target at the angle approximately 1 mrad. For extraction of the proton beam and focusing it on the external targets the septum magnets of the extraction slow system and elements of channel 8 are used. According to calculations this beam is polarized with the degree of up to 3%. 8 refs.; 14 figs.

16554 **(IFVE-OP—85-132) Setup for studying targets irradiated by high density proton beam.** Alferov, V.N.; Gusak, A.A.; Bayanov, B.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 21p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700720.

An experimental setup designed for investigation of the thermophysical processes in target-sources of secondary particles undergoing the radiation heating under the proton beam action is described. Proton energy is 70 GeV, intensity is up to 5.10/sup 13/ ppp. The use of short-focus lithium lens prmits to focus a beam into a spot of the diameter from 3 to 0.6 mm. The setup is equiped with precise techniques of beam parameter control and taget temperature state operating on-line with a computer. Results of mesuring equipment tests at the work with the beam and preliminary experimental data on energy release in a lead target are presented. 14 refs.; 13 figs.

16555 **(IFVE-OP—85-149) Relativistic positronium channel at the IHEP accelerator.** Gubrienko, K.I.; Zajtsev, M.M.; Zelenin, V.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700721.

Submitted to the journal Instrum. Exp. Tech. .

Positronium beams permit to investigate the interaction of ultrarelativistic atoms with a substance and observe the effect of superpermeability, measure the cross section of direct photons generation with low transverse momenta determine by model independent method the π/sup 0/-meson life time, realize testing the Lorentz transformations for momentum time and components of electromagnetic field at high values of gamma-factors. The high-vacuum channel intended for obtaining ultrarelativistic positronia at the Serpukhov accelerator is described. The total length of the channel is approximately 40 m. A weak transverse magnetic field in the section of 23 m length is created by purifying magnets with magnetic field of 56 Oe. For ensuring radiation safety a beam chopper is introduced into the channel. Positronium generation by protons with 70 GeV has been realized at internal rotating targets with of carbon films of 0.35 and 0.5 μm thickness. Described are the conditions of the experiment in the course of which relativistic positronia with gamma-factors from 800 to 2000 have been observed. Total quantity of positronia passed through. 14 refs.; 3 figs.; 1 tab.

16556 **(IFVE-ORI—85-148) Low-energy neutron spectra behind the IHEP accelerator shields.** Belogorlov, E.A.; Britvich, G.I.; Krupnyj, G.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700722.

More than 100 neutron spectra under different regimes of accelerator operation are studied to systematize and generalize the data on spectral composition of neutrons behind the IHEP accelerator shields. Thirty low-energy spectra characteristic to working rooms are presented in the paper. A method of the Bonner spectrometer is chosen for spectral analysis of neutrons. The resolution of neutron spectra presented in the given paper has been made by the PENS program within the energy range from 0.5 eV to 200 MeV. The given data testify unambiguously to the constructivity of the proposed classification of neutron spectra. A possibility is appeared with its help for apriory estimate of expected spectra of neutron depending on material and dimensions of the shield as well as on source-detector geometry. 7 refs.; 5 figs.; 2 tabs.

16557 (INIS-mf—10558, pp 30) **Intense neutron generator project at the Technical University Dresden.** Exkstein, P.; Gleisberg, F.; Helfer, H.; Jahn, U.; Krause, R.; Paffrath, E.; Schmidt, D.; Schwierz, R.; Seeliger, D.; Glotov, A.I. (Technische Univ., Dresden, German Democratic Republic. Sektion Physik). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

16558 (INIS-SU—370, pp 18-22) **On the proton beam characteristic detection in a cyclotron on multiple beam passage through a target.** Barit, I.Ya.; Katsaurov, L.N.; Nechaeva, L.P.; Khokhlov, Yu.K. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Technique for measuring of proton beam intersecting a thin target made of Al/sub 2/O/sub 3/ in the 600 keV sector cyclotron and for measuring energy spread of accelerated ions in this beam is described. Percentage composition of each portion of the beam incident onto the target is measured using the differential monitor. The target, which detected both the beam passage through it and relative beam intensity in each cycle, was used as a signal electrode. To measure increaments of the current and energy spread at the expense of multiple beam passage through a target, energy spectra of protons scattered on a target during single and multiple passage are compared. It is found out that during multiple beam passage current value increases 6 times as compared to single passage, and energy spectrum width increases from 19 KeV up to 34 keV.

16559 **(IPNO-DRE—85-16) Production of secondary radioactive beams from 44 MeV/u Ar projectiles.** Bimbot, R.; Della Negra, S.; Aguer, P.; Bastin, G.; Anne, R.; Delagrange, H.; Hubert, F. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1985. 52p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87750758.

Secondary beams have been produced through interaction of a 1760 MeV Ar beam with a 99 mg/cm^2 Be target. An achromatic spectrometer is used to select the magnetic rigidity corresponding to a given beam, and to transport this beam over a distance of about 18 m. The beam purity is studied using a solid state ΔE-E telescope. Beams of ^{35}S and ^{39}Cl are produced with a purity of about 80% and production rates of 1.5 10^{-6} Isub(o) and 5.10^{-5} Isub(o) respectively. Here Isub(o) denotes the primary beam intensity. Beams of ^{36}Ar, ^{39}Ar and ^{41}Kr are produced with about the same abundances as ^{39}Cl but with lower purities. It is shown that, by setting properly the experimental parameters, the beam production can be improved by a factor 2 to 5. This could lead to intensities of about 2.10^6 pps for ^{35}S and of 10^7 to 10^8 pps for the four other beams. The possibility of purifying these beams by placing a degrader between the two dipoles of the spectrometer is shown experimentally.

16560 **(JINR—13-85-306) Pulse voltage generator for electron cannon supply.** (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701327.

Submitted to the journal Instrum. Exp. Tech. .

Results of experimental investigation of interruption of current flowing through the hydrogen thyratron being in the longitudinal magnetic field of the short magnetic lens, are presented. The pulse voltage generator is developed on the basis of this phenomenon. Condensator and induction energy accumulators for the generator electron gun supply are combined. 6 refs.; 6 figs.; 1 tab.

16561 **(JINR—R-13-85-256) Some proposals on mass separation, precision mass spectrometry and acceleration of radioactive nuclides.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701339.

A possible variant of the magnetic analyzer of the mass separator on the accelerated charge particle beam is proposed. The possibility of using static multirevolution mass spectrometer with ion velocity focusing on the beam of mass separate radioactive nuclides for direct mass measurement is considered. The possibilities of using relatively small cyclotron with variation of the plane symmetric magnetic field for the acceleration of mass separated radioactive nuclides is consideredd. 3 refs.

16562 **(KIYI—86-34) Influence of the crater at the target surface on the ion outflow from laser produced plasma.** Dem'yanov, A.V.; Kononov, A.V.; Linev, A.F. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700841.

A rig of ion sources is described that is modified for investigation of ion composition, extracted from the plasma of a laser source. Experimental results and its brief discussion are presented. Al/sup +/, Al/sup +2/, Al/sup +3/ ions are obtained from plasma, produced by focused radiation of Nd-laser (flux density of radiation at the target approximately 10/sup 9/ W/cm/sup 2/). A decrease of ion outflow is detected due to the crater formation at the target surface. 8 refs.; 4 figs.

16563 **(LA-UR—86-3861) Operation of a magnetically filtered multicusp volume source.** Stevens, R.R. Jr.; York, R.L.; Leung, K.N.; Ehlers, K.W. (Los Alamos National Lab., NM (USA); Lawrence Berkeley Lab., CA (USA)). 1986. Contract W-7405-ENG-36. 12p. (CONF-8610115—19). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005131.

From 4. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (27 Oct 1986).

The results of experimental studies on an optimized version of the Lawrence Berkeley Laboratory (LBL) volume source are presented. Negative ion yields and emittance data were obtained for operation with both H^- and D^- beams. At high arc power, H^- beam currents up to 10 mA with rms normalized emittances of 0.0080 π.cm.mrad were obtained from a 6.3-mm-dia emission aperture. The yields of D^- beams were approximately half those of H^- beams, and the normalized emittances were 1.7 times smaller at the same current density. The results of these studies indicate that the present operation is limited by the extraction system rather than the ion source.

16564 **(LA-UR—86-3863) Spectroscopic investigation of H^- and D^- ion source plasmas.** Smith, H.V. Jr.; Allison, P.; Keller, R. (Los Alamos National Lab., NM (USA)). Oct 1986. Contract W-7405-ENG-36. 13p. (CONF-8610115—18). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005130.

From 4. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (27 Oct 1986).

Several H I (Balmer), Cs I, Cs II, and Mo I lines emitted by the small-angle source and 4X source plasmas are studied. After correcting for Stark broadening, the H/sub α/ line width gives the H-atom temperature kT/sub H/o. After correcting for Doppler broadening, the H/sub β/ and H/sub δ/ line widths give the electron density n/sub e/. For pulsed operation of both sources, kT/sub H/o is 1.5 to 2 eV and n/sub e/ is 1 to 2 x 10^{14}/cm^3, with kT/sub H/o and n/sub e/ scaling approximately with the square root of the discharge current. For the 4X source operated on D_2, kT/sub D/o and n/sub e/ are near the values of kT/sub H/o and n/sub e/ obtained for H_2 operation. Assuming that the H^-/D^- ion temperature equals the H/D-atom temperature, we deduce a lower limit to the H^-/D^- beam emittance.

16565 **(LBL—21293) Heater induced quenches in SSC [Superconducting Super Collider] model dipoles.** Hassenzahl, W.V. (Lawrence Berkeley Lab., CA (USA)). Oct 1986. Contract AC03-76SF00098. 7p. (CONF-860914—27). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003524.

From Applied superconductivity conference (ASC '86); Baltimore, MD, USA (28 Sep 1986).

A 1-m long SSC dipole constructed at the Lawrence Berkeley laboratory was subjected to a series of heater induced quenches to determine: axial quench propagation velocities, transverse quench propagation, and conductor temperature rise. Quenches were produced by 3 heaters at different locations in the magnet and at several currents. The results of these studies are described and are compared to previously published theoretical studies of quenches on the SSC dipoles. These results are shown to be in agreement with the calculations of the program "QUENCH", which includes an increase of the quench velocity during the first few milliseconds of the quench.

16566 **(LBL—22445) H^- ion source scaling studies at LBL.** Lietzke, A.F.; Hauck, C.A. (Lawrence Berkeley Lab., CA (USA)). Oct 1986. Contract AC03-76SF00098. 16p. (CONF-8610115—15). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004476.

From 4. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (27 Oct 1986).

Four experiments are reported. Constant arc voltage operation was compared with constant arc current operation over a similar range of plasma density. The higher arc voltage required in the constant arc current operation produced more H^-, but it was at the expense of an even larger increase in the accelerated electron current. A comparison of different magnetic filter locations showed the highest accelerated H^- and the lowest e^- content at the closest filter location. Beam-forming electrode aperture comparison for round apertures from 2mm to 10mm diameters and a 11 x 27 mm oval slot showed a decreasing H^- and e^- with increasing aperture area. Increasing accelerator voltage produced an increasing plasma potential and electron temperature and decreasing electron density in the exit chamber of the plasma source.

16567 **(LBL—22450) ECR [Electron Cyclotron Resonance] ion sources for cyclotrons.** Lyneis, C.M. (Lawrence Berkeley Lab., CA (USA)). Oct 1986. Contract AC03-76SF00098. 35p. (CONF-8610209—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87003532.

From RCNP/Kikuchi summer school on accelerator technology; Osaka, Japan (20 Oct 1986).

In the last decade ECR (Electron Cyclotron Resonance) ion sources have evolved from a single large, power consuming, complex prototype into a variety of compact, simple, reliable, efficient, high performance sources of high charge state ions for accelerators and atomic physics. The coupling of ECR sources to cyclotrons has resulted in significant performance gains in energy, intensity, reliability, and variety of ion species. Seven ECR sources are in regular operation with cyclotrons and numerous other projects are under development or in the planning stag. At least four laboratories have ECR sources dedicated for atomic physics research and other atomic physics programs share ECR sources with cyclotrons. An ECR source is now installed on the injector for the CERN SPS synchrotron to accelerate O^{8+} to relativistic energies. A project is underway at Argonne to couple an ECR source to a superconducting heavy-ion linac. Although tremendous progress has been made, the field of ECR sources is still a relatively young technology and

there is still the potential for further advances both in source development and understanding of the plasma physics. The development of ECR sources is reviewed. The important physics mechanisms which come into play in the operation of ECR Sources are discussed, along with various models for charge state distributions (CSD). The design and performance of several ECR sources are compared. The 88-Inch Cyclotron and the LBL ECR is used as an example of cyclotron+ECR operation. The future of ECR sources is considered.

16568 (NIIEFA-P-E—0671) **Calculation of strain-stressed state of the tyre system of superconducting dipole magnets.** Eregin, V.E.; Lamzin, E.A. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1984. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700844.

The problem dealing with determination of strain-stressed state (SSS) of demountable tyre constructions of superconducting dipole magnets is considered. Solution algorithm and numerical calculation results based on the COLLAR program SSS of one of the tyre constructions of the superconducting magnet for accelerating-storage complex are presented. 13 refs.; 5 figs.

16569 (TRI-PP—86-86) **The TRIUMF kaon factory proposal.** Hutcheon, D.A. (TRIUMF, Vancouver, British Columbia (Canada)). Oct 1986. 5p. (CONF-8610196—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE87900303.

From European workshop on few body physics; Rome, Italy (7 Oct 1986).

TRIUMF has recently proposed a kaon factory, consisting of a group of accelerators to produce a 100 μA, 30 GeV proton beam. The science program, the system of accelerators, the experimental area, and the current status of the proposal are described.

16570 **Design and modeling considerations for SSRL Beam Line Wunder.** Bachrach, R.Z.; Bringans, R.D.; Hower, N.; Lindau, I.; Pate, B.B.; Pianetta, P.; Swartz, L.E.; Tatchyn, R. (Xerox Palo Alto Research Center, 3333 Coyote Hill Rd., Palo Alto, CA 94304). pp 10-15 of Science with soft x-rays. Himpsel, F.J.; Klaffky, R.W. Bellingham, WA; SPIE Society of Photo-Optical Instrumentation Engineers (1983). (CONF-8310172—).

From Advances in soft x-ray science and technology conference; Upton, NY, USA (17 Oct 1983).

Standford Synchrotron Radiation Laboratory (SSRL) Beam Line Wunder will be the first soft X-ray energy range synchrotron radiation beam line specifically designed to exploit the unique aspects of periodic insertion devices in the wiggler-undulator (wunder) regime. Aspects of the development of this beam line are described. The authors emphasize the joint Optical, Thermal, and Mechanical optimization studies that were required.

4304 Storage Rings

REFER ALSO TO CITATION(S) 16532, 16533

16571 (BNL—39057) **Modes of storage ring coherent instabilities.** Wang, J.M. (Brookhaven National Lab., Upton, NY (USA)). Dec 1986. Contract AC02-76CH00016. 93p. (CONF-850768—12). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005256.

From SLAC summer institute on particle physics; Stanford, CA, USA (29 Jul 1985).

Longitudinal impedance in a beam and various modes of longitudinal coherent instabilities are discussed. The coasting beam coherent instability, microwave instability, and single-bunch longitudinal coherent instabilities are considered. The Vlasov equation is formulated, and a method of solving it is developed. The synchrotron modes are treated, which take the possible bunch shape distortion fully into consideration. A method of treating the synchrotron mode coupling in the case of a small bunch is discussed which takes advantage of the fact that only a few of the synchrotron modes can contribute in such a case. The effect of many bunches on the coherent motion of the beam and the longitudinal symmetric coupled bunch modes are discussed. The transverse impedance is then introduced, and the transverse coasting beam instability is discussed. Various bunched beam instabilities are discussed, including both single bunch instabilities and coupled bunch instabilities. The Vlasov equation for transverse as well as longitudinal motion of particles is introduced as well as a method of solving it within a linear approximation. Head-tail modes and short bunch instabilities and strong coupling instabilities in the long bunch case are covered. (LEW)

16572 (BNL—51959, pp 29-35) **PF experimental hall and some selected current topics in SR experiments.** Ando, M.; Ohta, T. (National Lab. for High Energy Physics, Tsukuba, Japan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The following topics from storage ring experiments are discussed; floor space, cranes, floor stability, radiation safety, imaging plates, plane wave x-ray topography, white and monochromatic x-ray topography, coronary angiography, electron neutrino mass, x-ray magnetic scattering, x-ray lithography, and photochemical vapor deposition.

16573 (BNL—51959, pp 36-49) **Berlin Electron Storage Ring BESSY: a dedicated XUV synchrotron radiation facility.** Muelhaupt, G.; Bradshaw, A.M. (Berliner Elektronenspeicherring-Gesellschaft fuer Synchrotronstrahlung mbH (BESSY), Berlin, West Germany). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

In response to national requirements in the fields of basic research, metrology and x-ray lithography it was decided in late 1977 to build a dedicated XUV synchrotron radiation source in Berlin. The history of the BESSY project, the user-oriented factors that determined the design parameters, the construction and commissioning of the facility as well as user operation and funding issues are reviewed.

16574 (BNL—51959, pp 50-74) **Origins, and the construction, commissioning and operation of the SRS.** Thompson, D.J. (SERC Daresbury Lab., Warrington, England). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The SRS was initiated in 1973 and approved in 1975. It came into use in 1981. The paper describes the organizational framework at the different stages, the pre-approval, construction, commissioning and operational phases of the storage ring, the build-up of experimental stations, and future plans. The emphasis is on lessons which can be learned by those about to embark on such a project, rather than on a detailed historical account, and on managerial rather than physics matters.

16575 (BNL—51959, pp 75-82) **Status of ADONE as synchrotron radiation source.** Bartalucci, S. (National Institute for Nuclear Physics, Frascati, Italy). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The first application of synchrotron radiation (SR) at Frascati started in 1965 which exploited the light coming from the electron-synchrotron for absorption and reflectivity measurements in the X-VUV region. Ten years later a project for the utilization of Synchrotron Light (PULS) was set up and the convention establishing the PULS collaboration was signed by the National Research Council (CNR) and the National Institute for Nuclear Physics (INFN). From 1975 to 1980 an experimental facility was built

around the photon beam line originating from a bending magnet of the storage ring ADONE. In 1975 the construction of a wiggler magnet for both machine physics studies and production of hard X rays was decided by the INFN. The wiggler was installed in 1978 on a straight section of ADONE and the compatibility with the normal operation of ADONE was demonstrated successfully. Also, a laboratory for the utilization of synchrotron light from this magnet (PWA) was built by INFN and inaugurated in May 1985. The present status of the storage ring ADONE is discussed and the main features of the SR facility are described.

16576 (BNL—51959, pp 83-97) **Overview of the UVSOR facility.** Kasuga, T.; Watanabe, M. (Institute for Molecular Science, Myodaiji, Japan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The Ultraviolet Synchrotron Orbital Radiation (UVSOR) Facility is a dedicated VUV source for studies of molecular science and related fields. It is a 600 MeV (max 750 MeV) electron storage ring, of which the injector is a 600 MeV synchrotron with a 15 MeV linac. They are located underground for radiation safety. Synchrotron radiation from ordinary bending sections is mainly utilized. Three insertion devices can be installed. The UVSOR Facility was first proposed in 1975. The construction started in 1980 with fabrication of measurement systems. In 1981, the construction of the light source started and its commissioning occurred on November 10, 1983. The commissioning and operation of the facility are described.

16577 (BNL—51959, pp 98-102) **University-based user facilities: lessons from Tantalus and Aladdin.** Huber, D.L. (Univ. of Wisconsin, Madison). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The establishment of university-based user facilities is a relatively new development in the federal funding of research in condensed matter science. Because the Synchrotron Radiation Center (SRC) has been a pioneer user facility, a certain degree of experience, both good and bad, has been acquired in the construction and operation of university-based facilities for synchrotron-related research. The history of SRC is discussed and some of the general lessons learned in the area of advanced planning are outlined. No attempt is made to be either definitive or exhaustive. In the present context, a university-based user facility is understood to be a dedicated facility under direct university control where a majority of the users come from outside the local university community.

16578 (BNL—51959, pp 103-113) **Present status of SOR-RING.** Ishii, T.; Isoyama, G. (Univ. of Tokyo, Japan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The present status of the SOR-RING, its initial commissioning and recent activity of the facility are described. The major steps taken during the initial commissioning were the replacement of the RF cavity, cleaning the vacuum chambers, refining the magnet system, and continual search for the best operating point. Experience with single bunch mode of operation and efforts to improve beam stability are also described.

16579 (BNL—51959, pp 114-125) **Orsay synchrotron radiation sources complex.** Sommer, M. (Laboratoire pour l'Utilization du Rayonnement Electromagnetique, Orsay, France). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

Since the early seventies, synchrotron radiation from the then existing circular colliders (ACO and later DCI) was used. This collaboration with the LAL High Energy Physics Laboratory was fruitful, and both machines are now dedicated for synchrotron radiation. These machines are discussed. In the early eighties it was obvious that a low emittance VUV source was a necessity. This is Super-ACO, now in construction. The properties of this machine are also summarized.

16580 (BNL—51959, pp 126-132) **Beijing Electron Positron Collider (BEPC) project.** Xie Jialin. (Institute of High Energy Physics, Beijing, China). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

BEPC is China's first high energy accelerator project which is being built to serve the dual purposes of carrying out particle physics studies on one hand and conducting synchrotron radiation experiments on the other. This project was formally approved at the end of 1983, and is scheduled to be completed at the end of 1988. Construction is in full swing. A brief account of the design, progress, and management of the project is presented.

16581 (BNL—51959, pp 133-140) **Compact synchrotron radiation source.** Liu, N.; Wang, T.; Tian, J.; Lin, Y.; Chen, S.; He, W.; Hu, Y.; Li, Q. (Tsinghua Univ., Beijing, China). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

A compact 800 MeV synchrotron radiation source is discussed. The storage ring has a circumference of 30.3 m, two 90 degree and four 45 degree bending magnet sections, two long straight sections and four short straight sections. The radius of the bending magnet is 2.224m. The critical wave length is 24A. The injector is a 15 Mev Microtron Electrons are accelerated from 15 Mev to 800 Mev by ramping the field of the ring. The expected stored current will be around 100 ma.

16582 (BNL—51959, pp 141-147) **Present status of the SRRC Project.** Chang, C.; Cheng, K.C.; Liu, Y.C.; Tseng, P.K. (Institute of Nuclear Energy Research, Lungtan, Taiwan). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

Upon the recommendation of the overseas Chinese scholars and the feasibility study group organized by the National Science Council, the government approved the establishment of the Synchrotron Radiation Research Center (SRRC) on July 9, 1983. The main goal of the SRRC project is to construct and operate an up-to-date 1 GeV synchrotron radiation source, with three beam lines for general experiments, in five to six years; to provide local scientists and returned scientists from abroad a facility to carry out frontier researches in both basic and applied science; and to elevate the technological capabilities of the related industries, universities, and research institutes through the construction of the machine. The background and present status of the project are discussed.

16583 (BNL—51959, pp 148-154) **HESYRL: a dedicated synchrotron radiation laboratory in China.** Qiu, L.J. (Univ. of Science and Technology of China, Anhui). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The HESYRL national synchrotron radiation laboratory was first proposed in 1977 as a conclusion of a general planning meeting on nationwide development of natural science and technology at which a topic was the application of synchrotron radiation. A study group was formed in 1978 to carry out preliminary research and prototype development work. The final approval of the project was given in April 1983 and the lab was soon founded. Designs of the main facilities and building completed in Oct 1984. The ground breaking was in Nov 1984. Manufacturing and purchasing of all the

equipment and components are now in progress. The overall layout of HESYRL project is shown. the main facilities are an 800 MeV electron storage ring, a 88 meter transport line and a 240 MeV linac as the injector. Some basic considerations in the selecting of major machine parameters are discussed.

16584 (BNL—51959, pp 155-166) **Design and status of Hefei light source.** Ho, T. (Univ. of Science and Technology of China, Anhui). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

Construction of a dedicated UV synchrotron radiation source is now underway at University of Science and Technology of China, Hefei, Anhui, China, and it is named as the Hefei National Synchrotron Radiation Laboratory (HESYRL). The facility was proposed in 1977 and authorized in 1983. The construction was started in October, 1984 and is expected to be completed in 1988. The purpose of the project is to meet the rapidly growing needs for applying synchrotron radiation in many fields, such as atomic and molecular physics, surface physics, chemistry, biology, medicine, material science, radiation metronology and lithography, etc. A general description of the facility is presented.

16585 (BNL—51959, pp 167-174) **Plan and present status of synchrotron radiation applications at HESYRL.** Zhang, Y.; Su, Y.; Qian, S.; Xu, X.; Jiang, D.; Xu, C. (Univ. of Science and Technology of China, Anhui). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

An 800 MeV electron storage ring is being constructed at Hefei, China. It is a dedicated UV synchrotron light source from which 27 beam lines could be extracted to accommodate about 50 experimental stations. Four beam lines and five stations are planned and some instruments have been designed and are under construction for the first five-year plan. The proposed experiments include x-ray lithography, soft x-ray microscopy, photoelectron spectroscopy, time-resolved spectroscopy and photochemistry.

16586 (BNL—51959, pp 188-194) **SUPER-ACO the new Orsay dedicated synchrotron radiation source.** Sommer, M. (Laboratoire pour l'Utilization du Rayonnement Electromagnetique, Orsay, France). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

Super-ACO is a 0.8 GeV storage ring optimized for low emittance and multi-insertions. A maximum of straight sections are installed in order to manage place for six insertions.

16587 (BNL—51959, pp 195-204) **European Synchrotron Radiation Facility.** Buras, B. (Riso National Lab., Roskilde, Denmark). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

How a European Synchrotron Radiation Facility has developed into a detailed proposal recently accepted as the basis for construction of the facility at Grenoble is discussed. In November 1977, the General Assembly of the European Science Foundation (ESF) approved the report of the ESF working party on synchrotron radiation entitled Synchrotron Radiation - a Perspective View for Europe. This report contained as one of its principal recommendations that work should commence on a feasibility study for a European synchrotron radiation laboratory having a dedicated hard X-ray storage ring and appropriate advanced instrumentation. In order to prepare a feasibility study the European Science Foundation set up the Ad-hoc Committee on Synchrotron Radiation, which in turn formed two working groups: one for the machine and another for instrumentation. This feasibility study was completed in 1979 with the publication of the Blue Book describing in detail the so called 1979 European Synchrotron Radiation Facility. The heart of the facility was a 5 GeV electron storage ring and it was assumed that mainly the radiation from bending magnets will be used. The facility is described.

16588 (BNL—51959, pp 205-219) **Brazilian Synchrotron Radiation Project.** Rodrigues, A.R.D.; Lobo, R. (Instituto de Fisica e Quimica, Sao Carlos, Brazil). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—).

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The proposal for a Brazilian national laboratory for synchrotron radiation is presented. The first design study led to a system consisting of a LINAC, an injection ring and a low emittance storage ring. The main ring is designed to be upgraded to 3GeV with an emittance of 4×10^{-8} rad.m. The design study also indicated the possibility of using the injection ring as a soft x-Rays/VUV source.

16589 (BNL—51959, pp 220-230) **Advanced Light Source, a 1-2 GeV synchrotron radiation facility.** Berkner, K.H. (Lawrence Berkeley Lab., CA). Oct 1985. NTIS, PC A11/MF A01. File Number DE87004151. (CONF-8510357—). Contract AC03-76SF00098.

From Workshop on the construction and commissioning of dedicated synchrotron radiation facilities; Upton, NY, USA (16 Oct 1985).

The Advanced Light Source (ALS), a dedicated synchrotron radiation facility optimized to generate soft x-ray and vacuum ultraviolet (XUV) light using magnetic insertion devices, was proposed by the Lawrence Berkeley Laboratory in 1982. It consists of a 1.3-GeV injection system, an electron storage ring optimized at 1.3 GeV (with the capability of 1.9-GeV operation), and a number of photon beamlines emanating from twelve 6-meter-long straight sections. In addition, 24 bending-magnet ports will be available for development. The ALS was conceived as a research tool whose range and power would stimulate fundamentally new research in fields from biology to materials science. The conceptual design and associated cost estimate for the ALS have been completed and reviewed by the US Department of Energy (DOE), but Title I activities have not yet begun. The focus in this study is on the history of the ALS as an example of how a technical construction project was conceived, designed, proposed, and validated within the framework of a national laboratory funded largely by the DOE.

16590 (CERN—86-06) **Theoretical aspects of some collective instabilities in high-energy particle storage rings.** Ruggiero, F. (European Organization for Nuclear Research, Geneva (Switzerland)). 8 Aug 1986. 64p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87700667.

After an introduction to single-particle dynamics, based on a unified Hamiltonian treatment of betatron and synchrotron oscillations, we consider two examples of collective instabilities which can limit the performances of high-energy storage rings: the transverse mode coupling instability, due to wake fields, and the incoherent beam-beam instability. Special emphasis is placed on the localization of the interactions between particles and surrounding structures, such as the accelerating RF cavities. We derive an exact invariant for the linearized synchrotron motion and, starting from the Vlasov equation, we discuss the coherent synchro-betatron resonances caused by localized impedance. Under suitable assumptions, we show that the effect of the beam-beam kicks in electron-positron machines can be described by new diffusive terms in a "renormalized" Fokker-Planck equation and is therefore equivalent to an additional source of noise for the betatron oscillations.

16591 (CONF-861114—28) **The Heidelberg test storage ring for heavy ions and its use for atomic physics.** Schuch, R. (Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.). Nov 1986. Contract AC05-84OR21400. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002811.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

A brief description of the Heavy-Ion Test Storage Ring (TSR) presently being built at the Max-Planck Institut in Heidel-

berg is given. It will be able to store ions injected from the tandem postaccelerator combination up to about 30 MeV/nucleon for a charge to mass ratio of 0.5. One of the main purposes of the TSR will be the study of electron cooling. Some atomic physics experiments are discussed using the electron cooling device which provides an electron-ion collision facility with good energy resolution and ion beams of high currents and low emittances. Here the possibilities for measurements of spontaneous and laser-induced radiative recombination and dielectronic recombination in the electron cooling section are discussed.

16592 **(EFI—800(27)-85) Space-angular distribution of Synchrotron radiation power in electron storage rings with account of betatron oscillations.** Tsakanov, V.M. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700687.

The space-angular distribution of synchrotron radiation (SR) power with account of betatron oscillations is examined. The distribution of SR power in the phase space (Xo, Xo', Yo, Yo') in the centre of radiation source is obtained, when the stationary electron distribution in the phase space (x, x', y, y') is available. The dependence of SR brightness on the electron storage ring structure and betatron oscillation frequencies is discussed. 11 refs.; 6 figs.; 1 tab.

44 INSTRUMENTATION

16593 **(BARC—1255) Biennial report for 1982 and 1983 of Electronics Division.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 54p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87701250.

The research and development activities of the Electronics Division of the Bhabha Atomic Research Centre, Bombay during the years 1982 and 1983 is presented in the form of individual summaries arranged under the headings: reactor instrumentations, nuclear instruments, medical instrumentation, local area network, general instruments. Other activities of the Division such as servicing of electronic equipments, provision of wiring and PCB facilities to computer network and micro based systems, training etc are also decribed in brief. A list of staff-members is given at the end.

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 15382, 15409, 15513, 15530, 15531, 15532, 15951, 16389, 16821, 16879, 16939, 17034, 17040, 17041, 17057, 17100, 17103, 17252, 17264

16594 **(ANL-HEP-CP—86-126) Report of the working group on detector simulation.** Price, L.E.; Lebrun, P. (Argonne National Lab., IL (USA); Fermi National Accelerator Lab., Batavia, IL (USA)). 1986. Contract W-31109-ENG-38. 13p. (CONF-8606215—33). NTIS, PC A02. File Number DE87004734.

From Summer study on the physics of the superconducting super collider ↑; 0.

An ad hoc group at Snowmass reviewed the need for detector simulation to support detectors at the SSC. This report first reviews currently available programs for detector simulation, both those written for single specific detectors and those aimed at general utility. It then considers the requirements for detector simulation for the SSC, with particular attention to enhancements that are needed relative to present programs. Finally, a list of recommendations is given.

16595 **(BNL—39104) Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source].** Spanne, P.; Rivers, M.L. (Brookhaven National Lab., Upton, NY (USA); Chicago Univ., IL (USA). Dept. of Geophysical Sciences; Linkoeping Univ. (Sweden). Dept. of Radiation Physics). Sep 1986. Contract AC02-76CH00016. 16p. (CONF-861114—43). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005252.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Results of microtomography experiments that employ filtered radiation from the National Synchrotron Light Source X-26 Microprobe beam line are presented. These experiments have yielded images of a freeze-dried caterpillar with a spatial resolution of the order of 30 μm and show that the limit on the spatial resolution with the present apparatus will be 1 to 10 μm. Directions for improvement in synchrotron microtomography techniques and some possible applications are discussed. 14 refs., 3 figs.

16596 **(CEA-CONF—8400) Studying reactor antineutron oscillations with large underground detectors.** Lagage, P.O. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Feb 1986. 7p. (CONF-860167—7). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750559.

From Recontres de Moriond workshop on massive neutrinos in particle physics and astrophysics; Tignes, Savoie, France (25 Jan 1986).

The various nuclear reactors on the planet induce a sizeable antineutrino background in most underground laboratories. In this paper, I discuss the possibility of studying neutrino oscillations on relatively large distances by detecting these antineutrinos in large underground detectors, like those currently proposed.

16597 **(CNIC—00010) Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement.** (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 11p. (In Chinese). (IAE—0010). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701280.

According to the principle of coincidence measurement, using probable statistics method, the method of processing data and evaluating uncertainty of $4\pi\beta$-γ coincidence measurement are inferred and summarized systematically. Computer programs written in Algol-60 and Fortran have overcome some shortcomings in normal calculation methods, reduced the calculation errors and have the advantages of strictness, systematization, completeness, fast speed and high efficiency. It can be widely used for calculating the radioactivity of many nuclides with various decay models.

16598 (CONF-860203—, pp 311-320) **Portable wide range instrument for beta radiation monitoring with minimum angular dependence.** Milakovic, J.; Frank, G.W.; Slobodien, M.J. (GPU Nuclear Corp., Middletown, PA). Dec 1986. NTIS $23.00. File Number DE86900357.

From 19. midyear topical symposium on health physics considerations in decontamination and decommissioning; Knoxville, TN, USA (2 Feb 1986).

Most commercially available instruments used for radiation monitoring have great directional dependence when used in beta radiation fields. This directional dependence can result in underestimating the beta radiation fields from areas with large amounts of surface contamination. Such conditions exist at the Three Mile Island Unit 2 plant as a result of deposits of primary coolant on floors, walls, pipes, cable trays, and the like. The Radiological Instrument Group at TMI developed a directionally independent beta/gamma ionization chamber detector for use with a Eberline Instrument RO-7. The probe is suitable for use in radiation field intensities from 0-20 krad per hour. The ionization chamber is an inexpensive adaptation of commercially available equipment. Tests using beta radiation from a Sr-90/Y-90 placque indicated that the angular response varied from 75% to 100% of true dose rate compared with 0-100% with the conventional RO-7 probe. The modification did not significantly alter the beta correction factor and still provided adequate buildup for accurate evaluation of gamma radiation exposure rates at 0.66 MeV (Cs-137). This paper provides construction details and results of tests for angular dependence, axial symmetry, and beta energy response using the isotopes Pm-147 (E/sub max/ .224 MeV), Tl-204 (E/sub max/ .76 MeV), and Sr-90/Y-90 (E/sub max/ 2.3 MeV).

16599 **(CONF-860961—8) Advanced research in instrumentation and control technology: Acoustic parameter studies.** Sheen, S.H.; Bobis, J.P.; Raptis, A.C. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004662.

From Instrumentation, components and materials contractors' meeting; Morgantown, WV, USA (16 Sep 1986).

In the process of developing acoustic/ultrasonic instruments for coal conversion and combustion processes, there is a need to understand various complex relations between acoustic parameters and physical properties of coal/gas and coal/liquid media so that the instrument readings and measurement accuracy can be evaluated and new sensing techniques can be developed. The primary objective of this project is to examine the theory and perform measurements of acoustic/ultrasonic parameters in such coal media. The acoustic parameters of interest are sound speed, attenuation, scattering pattern, and resonance scattering, which relate directly or indirectly to coal concentration, particle size and distribution, and rheological and thermal properties. In summary, we have developed a laboratory technique for accurate attenuation measurement in highly viscous liquids and coal slurries. For pure liquids, the attenuation in low frequency (0.8 to 2 MHz) provides a direct measurement of fluid shear viscosity. For coal slurries of low concentration (<10% by weight) attenuation in the same frequency range still follows the variation of fluid viscosity. But, for slurries of higher coal concentration, anomalous attenuation may be measured, depending on the fluid structure, which is believed to be a micor-inhomogeneous medium. 8 refs., 5 figs., 1 tab.

16600 **(CONF-861007—23) CCD[charge-coupled device]-based synchrotron x-ray detector for protein crystallography: Performance projected from an experiment.** Strauss, M.G.; Naday, I.; Sherman, I.S.; Kraimer, M.R.; Westbrook, E.M. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02. File Number DE87004956.

From Nuclear science and nuclear power systems symposium; Washington, DC, USA (29 Oct 1986).

The intense x radiation from a synchrotron source could, with a suitable detector, provide a complete set of diffraction images from a protein crystal before the crystal is damaged by radiation (2 to 3 min). An area detector consisting of a 40 mm dia. x-ray fluorescing phosphor, coupled with an image intensifier and lens to a CCD image sensor, was developed to determine the effectiveness of such a detector in protein crystallography. The detector was used in an experiment with a rotating anode x-ray generator. Diffraction patterns from a lysozyme crystal obtained with this detector are compared to those obtained with film. The two images appear to be virtually identical. The flux of 10^4 x-ray photons/s was observed on the detector at the rotating anode generator. At the 6-GeV synchrotron being designed at Argonne, the flux on an 80 x 80 mm^2 detector is expected to be $>10^9$ photons/s. The projected design of such a synchrotron detector shows that a diffraction-peak count $>10^6$ could be obtained in ~0.5 s. With an additional ~0.5 s readout time of a 512 x 512 pixel CCD, the data acquisition time per frame would be ~1 s so that ninety 1° diffraction images could be obtained, with approximately 1% precision, in less than 3 min.

16601 **(CONF-8606241—5) Note on electron spectrometer requirements for deep inelastic scattering studies.** Jackson, H.E. Jr. (Argonne National Lab., IL (USA)). 1986. Contract W-31-109-ENG-38. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87001557.

From 3. Continuous Electron Beam Accelerator Facility summer school; Newport News, VA, USA (23 Jun 1986).

The limitations placed on deep inelastic hadron production studies by a minimum electron spectrometer angle of 10° is discussed.

16602 **(CRN-CPR—84-1) Streak camera and picosecond metrology of laser impulses running at high repetitive rates.** Geist, P.; Martz, A.; Heisel, F.; Miehe, J.A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 1984. 48p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750453.

Some experimental configurations of a streak camera used with a synchronous pumped dye laser or with a repetitive mode-locked and Q-switched laser are described. The overall performances are discussed with respect to synchronous and triggered operating modes of the streak camera.

16603 **(EFI—735(50)-84) Monte-Carlo simulation of electromagnetic showers.** Amatuni, Ts.A. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1984. 56p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87700669.

The universal ELSS-1 program for Monte Carlo simulation of high energy electromagnetic showers in homogeneous absorbers of arbitrary geometry is written. The major processes and effects of electron and photon interaction with matter, particularly the Landau-Pomeranchuk-Migdal effect, are taken into account in the simulation procedures. The simulation results are compared with experimental data. Some characteristics of shower detectors and electromagnetic showers for energies up 1 TeV are calculated. 37 refs.; 9 figs.; 8 tabs.

16604 **(EFI—789(16)-85) On the possibility of using a neutron supermonitor in the ANI complex experiment.** Babayan, Kh.P. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700681.

The possibility of defining the spatial distribution of low energy hadrons in extensive air showers using the standard 18-NM-64 neutron supermonitor is considered. 15 refs.; 2 figs.

16605 **(EFI—792(19)-85) EhLEKTRON magnetic spectrometer calibration.** Bagdasaryan, D.S.; Boyakhchyan, E.M.; Kazaryan, G.B.; Karibyan, M.D.; Markaryan, Eh.R.; Mkrtchyan, G.G. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700683.

Characteristics of the Ehlectron spectrometer are experimentally investigated. The comparison of the results of Monte Carlo calculations with experiment shows a good consistency of real and expected parameters of the setup. The setup is calibrated by the measurement of the process of elastic ep scattering using the subtraction method. 5 refs.; 8 figs.; 1 tab.

16606 **(EFI—794(21)-85) Identification of electrons by means of a scintillation telescope at Esub(e) = 1-3 GeV.** Bagdasaryan, D.S.; Karibyan, M.D.; Kazaryan, G.B. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700685.

Characteristics of a telescope counter including three scintillation detectors and lead converter are given. It is shown that the hadron (π/sup -/) quenching factor of the order of 2.5 x 10/sup -2/ may be obtained by chaosing the radiator thickness on the maximum of the electromagnetic cascade by a system of 3 scintillation counters at the electron detection with the efficiency of about 95% in the momentum range of 1-2.5 GeV/c. The telescope considered is a part of the Ehlektron magnetic spectrometer detecting equipment. 6 refs.; 6 figs.

16607 **(EFI—803(30)-85) Sandwich nuclear emulsion emitter-detector-emitter systems with regulated sensitivity.** Akopova, A.B.; Arutyunyan, M.M.; Kartuzhanskij, A.L.; Magradze, N.V.; Moiseenko, A.A.; Ovnanyan, K.M.; Chalabyan, T.S. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700688.

The method of decelerated development of multicharge particle trace in 200 μm layers of nuclear emulsion providing to regu-

late the ionizing threshold of development and to obtain the trace density low enough for counting the individual grains in it is suggested. The method is based on dosed poisoning of emulsion monocrystals by Br/sup -/ ions diffusing to the layer from special emitting layers of the same emulsion glued to its both sides; the emitting layers have been previously exposed to a low depth by the blue-violet light. If the emitters are glued to the detector by exposed surfaces, the emission from them and the diffusion of Br/sup -/ ions during the reduction of AgBr up to Ag in the developed can be well regulated owing both to the value of the light exposure on the emitters and joint development condition of the emitter-detector-emitter glued sandwich. 2 refs.; 7 figs.

16608 **(EFI—813(40)-85) Time and amplitude characteristics of multiwire detectors.** Gavalyan, V.G.; Lorikyan, M.P.; Sarkisyan, Yu.G. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700690.

A multiwire dielectric detector with separated anode wires is described. The measurement results of its time and amplitude resolution are given. It is shown that the multiwire emission detector does not differ in its characteristics from a multiwire dielectric one. 10 refs.; 2 figs.

16609 **(EFI—819(46)-85) Design principle and structure of the ANI data centre.** Akopov, N.Z.; Arutyunyan, S.Kh.; Chilingaryan, A.A.; Galfayan, S.Kh.; Matevosyan, V.Kh.; Zazyan, M.Z. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700691.

The design principles and structure of applied statistical programms used for processing the data from the ANI experiments are described. Nonparametric algorithms provide development of high-efficient method for simultaneous analysis of computerized and experimental data, from cosmic ray experiments. Relation data base for unified data storage, protection, renewing and erasuring as well as for fast and convenient information retrieval is considered. 8 refs.

16610 **(FEI—1632) Resolution of spectrometric systems of various types. Problem statement.** Semenov, V.P.; Trykov, L.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700696.

Results of theoretical investigation into spectrometer resolution of different types of ionizing radiaton are presented. Notions of spectrometric system and its information quality are introduced. The problem of the main types of spectrometric systems is sonsidered. A non-traditional approach to assesement of resolution is formulated, general mathematical formulation of the problem for assesement of resolution is given. 10 refs.; 1 fig.

16611 **(FNAL-TM—1434) Sources for proportional tube gain variation: What to do about it.** Fukui, Y.; Mishina, M.; Hayashide, Y.; Kanda, S.; Kim, S.; Kondo, K.; Masuzawa, M.; Miyashita, S.; Miyata, H.; Mori, S. (Fermi National Accelerator Lab., Batavia, IL (USA); KEK, Oho-machi, Ibaraki-ken (Japan); Tsukuba Univ., Sakura, Ibaraki (Japan); Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research). Oct 1985. Contract AC02-76CH03000. 25p. (CONF-8510308—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005561.

From Gas sampling calorimetry workshop; Batavia, IL, USA (31 Oct 1985).

In the high-energy domain systematic uncertainties become a substantial fraction of attainable energy resolution of a proportional tube electromagnetic calorimeter. Sources of nonuniformity and fluctuation of calorimeter response are discussed and test data on the magnitude of the effects are presented. Possible ways of maintaining these effects under control are discussed and test data are discussed which demonstrated that such effects could in fact be monitored and corrected to less than 1%.

16612 **(GSI—86-16) Development of an universal particle telescope with large dynamics for light and medium heavy fragments.** Wessels, P. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Jun 1986. 70p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87750513.

In the present work the development of a particle telescope with a large dynamical range is described which consists of a high-pressure parallel-plate counter, an ionization chamber with field-parallel incidence, and a scintillation counter in phoswich construction. Because of its simple mechanical construction it could be easily fabricated and reliably operated. The modul construction of the telescope permitted the easy exchange respectively the changes of single components. The characteristic quantities of the telescope which were determined in laboratory tests and measurements on the beam are presented in the following. The time resolution of the parallel-plate counter amounted to 480 psec. By means of the parallel-plate counter a trigger for complex fragments ($Z \geqq 2$) could be generated the sensitivity threshold of which could be variably regulated above a limit. By the ionization chamber the resolution in the energy loss for α particles (5-6 MeV) could be determined in the laboratory to 5.3%. It could be shown that by different measuring methods nuclei with nuclear charge numbers between $Z=1$ and $Z \approx 35$ could be identified in an energy range from propor to1 MeV/u to 80 MeV/u. The measured resolution $\Delta Z/Z$ amounted to between 2.3% and 6.2% dependently from the nuclear charge. This particle telescope is currently constructed in a series of 30 exemplars. Of these, 24 shall be applied in experiments on the study of the decay of highly excited nuclei at the UNILAC and at the GANIL accelerator.

16613 **(IFVE-OEF—85-40) Cherenkov radiation ring spectrometers with hodoscopic photomultipliers for measurement of particle velocity with momentum up to 300 GeV/c.** Baldin, B.Yu.; Vasil'chenko, V.G.; Volkov, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700711.

Variants of Cherenkov radiation ring spectrometers with hodoscopic photomultipliers intended for identify π, K, p with momentum up to 300 GeV/c are considered. Basic characteristics of spectrometers and ways of their further development are presented. 9 refs.; 6 figs.; 2 tabs.

16614 **(IFVE-OEF—85-153) Hodoscope photomultipliers and their application in particle detectors.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 30p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87701288.

The development of hodoscope photomultipliers and their basic characteristics are described. Their application in particle detectors is described. 54 refs.; 20 figs.; 3 tabs.

16615 **(IFVE-OEF—85-174) Study of light pulse shape from polystyrene scintillators.** Peresypkin, A.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700712.

Submitted to the journal Instrum. Exp. Tech. .

The light pulse shape of plastic scintillators with PPO and POPOP additions was measured by a single photon counting technique. When analyzing the results, much attention was given to the beginning of a scintillation burst (start burning). At present this problem was little studied experimentally, and the papers available contradict the theory. The measurements show that de-excitation kinetics is well described by the Forster theory. 11 refs.; 1 fig.

16616 (IFVE-OEF-ORI—85-36) **Radial distributions of shower energy deposition in hadron and photon hodoscopic sandwich-type calorimeters with cell structure.** Bajshev, I.S.; Mokhov, N.V.; Semenov, V.K. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700713.

The average energy deposition behaviour for the showers in the cell-structure scintillation hadron and photon calorimeter depending on the distance between the centres of cells and coordinates of the point where a 3 GeV particle initiated the shower has been measured. The experimentally obtained dependences are compared with the Monte-Carlo calculated radial distributions of the shower energy deposition integrated over the total calorimeter depth and over the area occupied by the cell. The values for the radial distribution parametrs are defined by fitting the experimental data with model descriptions, which at the obtained values for the parameters agree quite satisfactorily with Monte-Carlo calculations. Cell performances have been obtained. Axial light collection system with cyllindrical WLS in cells has been used. 28 refs.; 7 figs.

16617 (IFVE-ONF—85-73) **Rectangular drift tube characteristics.** Denisov, D.S.; Musienko, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700718.

Submitted to the journal Instrum. Exp. Tech. .

Results on the study of the characteristics of a 50 x 100 mm aluminium drift tube are presented. The tube was filled with argon-methane and argon-isobutane mixtures. With 16 per cent methane concentration the largest deviation from a linear relation between the drift time and the drift path over 50 mm is less than 2 mm. The tube filled with argon-isobutane mixture is capable of operating in a limited streamer mode. 9 refs.; 5 figs.

16618 (IFVE-ONF-OEF—85-157) **Using pulse fall of a drift proportional tube for time resolution improvement.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701289.

Submitted to the journal Instrum. Exp. Tech. .

Time characteristics of a proportional drift tube 1.5 m longand 30 mm in diametr filled with argon-methane mixture, have been studied on the beam. By timing to the pulse fall from minimally ionizing particles time resolution of 20 ns (FWHM) has been obtained. 3 refs.; 2 figs.

16619 (INIS-mf—10554) **Spectrometry and in core dosimetry of neutron radiation. Part I. Invited papers.** Marencak, M. (ed.). (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1985. 102p. (In Czech). (CONF-8503268—Pt.1). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735.

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

The proceedings contain 8 invited papers discussing current problems of spectrometry and in core neutron dosimetry with regard to applications in nuclear power engineering. The papers deal with the following areas: reactor physics and in core dosimetry; calculations of the spatial and energy distribution of neutrons in the reactor core and shielding; proton-recoil neutron spectrometry; determining neutron spectra with activation detectors; assessment of measurement system used in core dosimetry; in core measurement and monitoring of the reactor radiation field; monitoring the radiation damage to reactor structural materials. (J.P.).

16620 (INIS-mf—10554, pp 7-13) **Reactor physics (nuclear power plant design and operation) and in core dosimetry.** Petr, J. (Ceske Vysoke Uceni Technicke, Prague, Czechoslovakia. Fakulta Jaderna a Fysikalne Inzenyrska). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

In core dosimetry is closely linked with the research of radiation damage to structural materials of the nuclear reactor, especially of pressure vessels. In order to fulfil the surveillance programme of WWER reactor pressure vessels, it is necessary to define accurately the spectra of mixed neutron and gamma radiation. For the said reasons it is necessary to set up a workplace which would not only collect nuclear data but would also provide services and build a facility to provide standard neutron spectra. An experimental facility with a neutron field in the ranges of medium and higher energies will have to be built in the sense of definitions recommended by the IAEA. (J.P.).

16621 (INIS-mf—10554, pp 65-78) **Assessment of in core dosimetry measuring systems.** Racek, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

The general and specific principles are given for the differential spectroscopy of fast neutrons in mixed reactor radiation. Block diagrams are given of a /sup 6/LiF spectrometer, a spectrometer with a proportional hydrogen chamber and a spectrometer with scintillation detectors. The selected properties are given of basic assemblies of spectrometric systems such as the detector-preamplifier, amplifier, ADC, TAC converters, analyzer. (E.S.).

16622 (INIS-mf—10554, pp 37-48) **Proton-recoil neutron spectrometry.** Holman, M. (Skoda, Plzen, Czechoslovakia. Zavod Energeticke Strojirenstvi). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

A brief analysis is made of the method of recoil protons using the combined measurement with a scintillation spectrometer with a 10 mm dia. by 10 mm thick stilbene crystal and a set of spherical proportional chambers filled with hydrogen to a pressure of 392.4; 981; 392.4; 98.1 kPa. Pulse shape discrimination was used for gamma radiation discrimination. Programs in FORTRAN IV identical for all detectors were used for evaluating the spectra. The evalution proceeded from the hardest to the softest components of the spectrum. Prior to the evaluation, energy calibration was made of each of the components. The energy calibration is described of detectors which is related to the adjustment of optimal operating modes of detectors. One source of errors is the anisotropy of the detectors. The spherical hydrogen chambers were tested in the neutron beam and differences were found in absolute values of the spectra measured at neutron impingement angles 0 and $\pi/2$ to the detector anode; the efficiency of the chambers varied roughly by 10 to 20%. The efficiency of the scintillation spectrometer was determined by measuring the neutron spectrum from the fission of /sup 252/Cf, the source-to-detector distance being 1 m. A comparison of the computed and measured spectra showed good agreement in absolute values and in the spectrum shape with an error smaller than 5% in the energy range 1 to 10 MeV. Deviations of actual efficiency from theory were found when the chambers were tested by comparison with the scintillation spectrometer. (J.P.).

16623 (INIS-mf—10554, pp 49-64) **Neutron spectrum determination with activation detectors.** Osmera, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

The methods are presented of calculating neutron spectra. Programs were written allowing to analyze, measurement in the whole energy range of reactor neutrons. The characteristic properties are given of SPECTRA, CRYSTAL BALL and SAND-II programs. The accuracy is evaluated of results obtained by these programs and the conclusions are summed up of an international comparison known as REAL-80. The selection is discussed of suitable activation detectors and their use for measuring neutron spectra in reactors. Tables show basic data for monitoring the neutron field in

the 57/10 channel of the WWR-S reactor and the evaluation of irradiation experiments on samples of ferritic materials. (E.S.).

16624 (INIS-mf—10554, pp 79-96) **In core measurement and monitoring of reactor (neutron) radiation field.** Erben, O. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700735. (CONF-8503268—Pt.1).

From Workshop on spectrometry and in core dosimetry of neutron radiation; Rez, Czechoslovakia (20 Mar 1985).

A survey is presented of in core radiation detectors. The principles are described of activation detectors, fission chambers, self-powered neutron detectors and thermal sensors. Systems of in core measurement for WWER nuclear power plants, nuclear reactors of power plants operated by KWU, Babcock and Wilcox, Combustion Engineering and FRAMATOME are described. (E.S.).

16625 (INIS-mf—10556-Vol.1, pp 374-376) **Collinear laser spectroscopy: a new tool in nuclear physics.** Huber, G. (Mainz Univ., Germany, F.R. Inst. fuer Physik). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The use of collinear laser spectroscopy is discussed with regard to on-line mass separation of nuclear reaction products in the study of static nuclear moments (spin I, magnetic dipole moment μ/sub I/, electric quadrupole moment Q/sub s/) and the differential charge radius $\delta\langle r/sup\ 2/\rangle$ of radioactive isotopes. The experimental configuration of the GSI heavy ion accelerator is described. (S.P.).

16626 (INIS-mf—10558, pp 29) **Progress in the detection of low energy neutrons.** Wasson, O.A. (National Bureau of Standards, Gaithersburg, MD, USA). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

16627 (INIS-mf—10558, pp 32) **Time of flight spectrometer for the measurement of gamma correlated neutron spectra.** Anriashin, A.V.; Derkin, B.V.; Lychagin, A.A.; Min'ko, J.V.; Mironov, A.N.; Nesterenko, V.S.; Sztaricskai, T.; Peto, G.; Vasvary, L. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

16628 (INIS-mf—10559) **Automated beta spectrometer.** Jursova, L.; Broj, K.; Novakova, O.; Bendl, J.; Javornicky, K.; Vasek, T. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky). Nov 1985. 96p. (In Czech). NTIS (US Sales Only), PC A05/MF A01. File Number DE87700740.

The first Czechoslovak liquid scintillation spectrometer was designed for the detection of radionuclides emitting low energy particles. Its high detection efficiency is due to 4π geometry and the low energy threshold of the evaluation equipment. The feasibiity is claimed of attaining the required parameters using only components manufactured in Czechoslovakia. It is assumed that for /sup 3/H a total detection efficiency of 40 to 45% will be achieved (world standard 60%) because commercial photomultipliers do not allow better performance. In a later stage the shape of the detection chamber will be optimized, lightproof closure designed, shielding of the radioisotope in non-operating position devised, etc. (J.C.).

16629 (JINR—13-85-754) **Double-arm time-of-flight spectrometer for the DEMAS installation.** Will, E.; Sodan, H.; Luk'yanov, S.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700768.

A double-arm time-of-flight spectrometer for the DEhMAS installation intended to registrate and study the characteristics of fragment-like products produced in heavy-ion reactions with complex nuclei is described. The base of the spectrometer are two identical mobile position sensitive time-of-flight arms. Each arm consists of a transmission detector on the base of microchannel electron multiplier and a plane-parallel avalance counter, which permit to determine the velocity, and of a position sensitive ionization chamber which measures the energy, X and Y coordinates of detected particle. Time-of-flight coordinate measurements permit to identify detected products by mass, energy, space distribution at mass resolution being M=+-1.5 a.e.m. The principle of correlation measurements is also described basing on which one can separate products belonging to a definite reaction channel. 14 refs.; 9 figs.; 1 tab.

16630 (JINR—13-85-810) **TV event recorder.** Butenko, V.A.; Vyskochil, S.; Drozdov, V.A.; Zav'yalov, V.F.; Men'shikov, A.L.; Kissling, H.; Prikhod'ko, V.I.; Maly, M.; Miksh, A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700770.

A TV event recorder intended for data monitoring from spark and streamer chambers is described. It contains a camera tube, videoprocessor, scanning control unit, digitizer, synchronizer, TV-image memory device, autonomous calibration system and TV-monitor. The event images in a track detector are trasferred to a TV-monitor for visual observation and their digitized images are conveyed via CAMAC-interface to the computer for recording on magnetic tape and further processing. The TV system described may be used in any experiment requiring observation and detection of single shot high-speed shuttered pictures. 6 refs.; 4 figs.

16631 (JINR—13-85-817) **Analog-to-digital converter.** Dinh Sy Hien; Nguen Ngoc Lam; Kalinin, A.I.; Nguen Suan Hong. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 3p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700771.

Analog-to-digital converter (ADC) with 4096 channel number for applications in nuclear spectroscopy systems is described. It is capable to measure pulse and slowly variable or constant voltage. The ADC contains a Wilkinson type analog-to-time converter for an oscillator of 200 MHz clock rate, a twelve bit address scaler and has the following technical specifications: input signal polarity-positive; input signal amplitude - from 0.05 V to 5 V; differential nonlinearity is +-2%; integral nonlinearity is not over 0.1%; temperature instability - 0.2 channel/deg C on the level of 4096 channels. ADC is made in a unit width module in CAMAC standard. 3 refs.; 1 fig.

16632 (JINR—13-86-13) **Time planar HPGe detectors.** Abrosimov, V.N.; Morozov, V.A.; Osipenko, B.P.; Prazhak, F.; Stegajlov, V.I.; Yurkovskij, Ya. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1986. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700774.

The time resolution of the planar HPGe detectors was investigated with small value of the dead layer of (p, n) transition. The time resolution is 2tau/sub 0/=0.95 ns for Esub(γ)1332 keV in coincidence with β/sup -/-particles of /sup 60/Co. 4 refs.; 9 figs.; 2 tabs.

16633 (JINR—D-13-85-653) **Readout method for wire chambers.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701328.

Submitted to the journal Nucl. Instrum. Methods.

The method for readout of information from wire chambers through a transparant wire cathode is investigated in order to sdudy the possibilities of its practical usage. To observe the shape and amplitude of the signal induced on an external readout electrode depends on the detector geometry and makes approximately 10% percent of the anode signal values. The application of this method should permit one to distinguish a detector in active device

and independent readout system more fleaxible and to improve detector coordinate properties. 2 refs.; 1 fig.

16634 **(JINR—E-16-85-814) Influence of different detector parameters on the neutron sensitivity of OSL-detectors.** Fellinger, J.; Huebner, K.; Schmidt, P.; Henniger, J. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety). 1985. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700786.

On the base of a method for the calculation of the neutron sensitivity of OSL detectors with a high contents of hydrogen a systematic investigation of the influence of different detector parameters on the neutron sensitivity was carried out. The detector thickness, the thickness of the contact radiator, the luminophor contents and the grain size of the used luminophor influence the neutron sensitivity, first of all in the energy range of fast neutrons. Especially the use of small grain luminophor considerably increases the sensitivity whereas the other parameters have a small influence on the neutron sensitivity. The neutron sensitivities calculated and experimentally determined at variation of the detector parameters are in good agreement. 17 refs.; 5 figs.; 3 tabs.

16635 **(JINR—R-13-85-819) Investigation of spatial resolution of plastic streamer tubes.** (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701340.

Submitted to the journal Instrum. Exp. Tech. .

A possibility of use detectors on the base of plastic streamer tubes for precise particle coordinate determination is tested. The method, based on determination of charge centroid, which is induced by external electrodes, provides the space resolution deltasub(x)=530 μm, and resolution of the method based on drift time measurement is 110 μm < deltasub(x) < 350 μm. The electron drift velocity measured in the argon-isobutane gas mixture with a high isobutane concentration (1Ar:3C/sub 4/H/sub 10/) was (41.8 +- 4.3) x 10/sup 5/ cm/s. Coordinate accuracy obtained in both cases is better than that required to muon spectrometers with magnetized iron. It permits to use plastic streamer tubes for particle trajectory determination in such installations. 15 refs.; 12 figs.

16636 **(JINR-R—6-85-753) On relative detection efficiency of a channel electron multiplier for electrostatic beta spectrometer.** Inoyatov, A.Kh.; Briancon, Ch.; Vallen, R.; Legrand, B.; Burin, K.; Vulov, Ts.; Minkova, A.; Pokrovskij, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700805.

The relative detection efficiency of the Bendix CEM 4503 type channel electron multiplier (CEM) which serves as an electron detector in an electrostatic beta spectrometer is studied in the 60-1000 eV energy range. A decreasing of the quantity studied by a factor 3 is observed at low electron energies. To increase the CEM efficiency resulting in increasing the total spectrometer efficiency the acceleration of detected electrons is applied. Optimum operation conditions of the CEM permiting to increase the signal-to-background ratio by a factor 2 without any visible change of the resolution and the response function of the spectrometer have been determined as well. 9 refs.; 13 figs.

16637 **(JINR-R—10-85-744) Dialogue scanning measuring systems.** Borodyuk, V.P.; Shkundenkov, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700807.

Submitted to the collection Avtomatizatsiya nauchnykh issledovanij.

The main developments of scanning measuring systems intended for mass precision processing of films in nuclear physics problems and in related fields are reviewed. A special attention is paid to the problem of creation of dialogue systems which permit to simplify the development of control computer software. 54 refs.

16638 **(JINR-R—10-85-783) Realization of one algorithm for track elements isolation in analyzing the images of nuclear interactions.** Astakhov, A.Ya. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700809.

The algorithm for isolation of track elements, based on the analysis of geometrical characteristics of dashed images is described. For the analysis, the pattern under investigation is expanded into elementary cells in terms of strings and columns. The peculiarities of scheme-technical solutions of electronic equipment for the track and noise filtering on one string and on the successive strings are listed. 3 refs.; 4 figs.

16639 **(JINR-R—13-85-752) Measuring module of an apparatus for polarization analysis of ultracold neutrons on the base of microcomputer.** Elizarov, O.I.; Zhukov, G.P.; Zamrij, V.N.; Roganov, A.B.; Sever'yanov, V.M.; Taran, Yu.V.; Shirokov, V.K.; Shchelev, A.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700814.

An apparatus with neutron storage and a measuring module based on a set of CAMAC blocks and a microcomputer have been installed on the ultracold neutron (UCN) channel of the IBR-2 pulsed reactor for studying the polarization characteristics of ferromagnetic films. The measuring module provides for the time analysis of pulses from the UCN detector, spectrometric data equisition, measuring cycle timing, overall system control and monitoring of up to 32 its parameters. As a part of soft ware a special language has been developed consisting of a set of interpreting commands. The measuring module and its software enables one to change easily the modes and operation cycle of the apparatus, provides for a wide range experimental program and for carrying out protracted measurements in an automatic mode. 11 refs.; 2 figs.

16640 **(JINR-R—15-85-786) Electrostatic separator of total fusion reaction products in the heavy ion beam of Vasilisa installation.** Eremin, A.V.; Tarabrin, V.A.; Stepantsov, S.V.; Obukhov, Yu.L.; Ter-Akopyan, G.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1985. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700815.

An electrostatic separator under construction at the Joint Institute for Nuclear Research, using three stages of separation of primary beam ions and of scattered ions has been described. The setup has evaporation recoil focusing system and will be used for separation of reaction products generated by heavy ions with a mass from 20 to 60 a.m.u. with target nuclei of masses greater than 100 a.m.u. It is shown that the separator allows to select recoil atoms emitted from a target under +-3 deg angle with relative energy width of +-10% and within the relative charge range of +-5%. It is experimentally tested that after one stage of electrostatic separation the decontamination factor for recoil atoms from beam ions is 10/sup 5/. 21 refs.; 3 figs.; 1 tab.

16641 **(JINR-R—16-85-802) Energy dependence of some neutron dosimeter sensitivities in the 1 eV up to 4 keV energy range.** Buchnev, V.N.; Komochkov, M.M.; Mokrov, Yu.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety). 1985. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700816.

The sensitivities of DN-A-1 device and SNM-14 slow neutron counter with a combined moderator in the 1 eV up to 4 keV energy range has been experimentally determined. The IBR-30 reactor served as a neutron source, spectral distribution was performed by the time-of-flight method. The sensitivity constancy of a long counter in the 1 eV up to 4 keV energy range has been experimentally shown. The obtained sensitivity values and other data available could be used in determining energy dependencies of the device sensitivity in essential neutron energy range. It permits to evaluate their errors when using as dosimeters in radiation fields of nuclear physics installations. 6 refs.; 9 figs.

16642 (KIYI—85-13) Automation correlation installation on-line with a computer. Vishnevskij, V.A.; Tkachuk, I.P.; Dej, Yu.A.; Lashko, T.N.; Patlan', Yu.V.; Sidorenko, V.A.; Trishin, V.V.; Chaplitskaya, T.V. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700828.

On the base of the SM-4 computer and CAMAC equipment the automatic three-dimensional spectrometer was made in order to carry out the correlation experiment at the U-240 cyclotron at the Institute for Nuclear Research, The Ukrainian Academy of Science. A block-diagram of correlation installation, units of automatic equipment and software implemented for automatic installation procedure were described. A package of SPECTR programmes for interpretation of linear γ-spectra and $\gamma\gamma$-coincidence spectra was established. Reslts of check experiments were cited. 7 refs.; 7 figs.

16643 (KIYI—85-27) Radioactive contaminations of materials for low-background setups. Bondarenko, O.A.; Gar'kusha, G.N.; Danevich, F.A. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 40p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700835.

The methods and results of studying of the radioactive contaminations in different materials are described. The measurements were made by means of various scintillation and semiconductor Ge(Li) detectors in 1982-1985. The materials have been indicated not advisable to use in low-background setups. Various detector sensitivities are discussed at measurements of low activities. 15 refs.; 22 figs.; 6 tabs.

16644 (KIYI—85-28) Investigation of backgrounds of scintillation and semiconductor detectors in the underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences. Zdesenko, Yu.G.; Kropivyanskij, B.N.; Kuts, V.N.; Nikolajko, A.S.; Bondarenko, O.A.; Kostezh, A.B. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 29p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700836.

The underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences is situated in a salt mine of Solotvina (Zakarpatskaya region) at the depth of 1000 meters of water equivalent. The background conditions at the laboratory were measured by the lowbackground semiconductor and scintillator detectors. The use of additional lead, polyethylene and mercury shielding allowed to reduce the background of Ge(Zi) detector in 100 times approximately as compared to the analogous measurements at the earth's surface. 7 refs.; 13 figs.; 5 tabs.

16645 (KIYI—85-36) Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face. Kirnas, I.G.; Litovchenko, P.G.; Petrosyan, Eh.E.; Pashchuk, N.N. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 28p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700840.

In paper based on a model of coaxial detetor with one-open face (spherical coaxial detector - SC - detector) E(r)-dependenceis shown experimentally to be stronger than in coaxial detectors with two open faces (right coaxial detector - RC - detector). The analytical expression for E(r) determination is obtained for cases, where (Nsub(a)-Nsub(d))=0 and (Nsub(a)-Nsub(d)) not equal 0=const. The expressions are obtained allowing to determine (Nsub(a)-Nsub(d))=f(r) and E(r) from voltage-capacitance characteristics in face part of SC-detectors, where (Nsub(a)-Nsub(d)) value is changed arbitrarily by detector volume (e.g. in Ge-(Li)-detectors). 10 refs.; 9 figs.

16646 (KURRI-TR—266) Proceedings of the specialist research meeting on measurements of short-lived isotopes. Yoshizawa, Yasukazu; Okano, Kotoyuki; Kawase, Yoichi (eds.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Apr 1985. 67p. (In Japanese). (CONF-8501103—Summs.). NTIS (US Sales Only), PC A04/MF A01. File Number DE87701222.

From Specialist research meeting on measurements of short-lived isotopes; Kyoto, Japan (9 Jan 1985).

In order to discuss various problems associated with experimental techniques for the study of short-lived nuclei produced by a research reactor or an accelerator, and to exchange informations on the important progress in this field, the specialist research meeting on the measurements of short-lived isotopes was held in this institute (KURRI), 9-10, January, 1985. Recent developments on ISOL systems and on other measuring instruments made at several universities and research institutes in Japan were reported, together with recent informations on ISOL systems in other countries. These are summarized in written form and are presented here.

16647 (LA—10815-MS) Field test and calibration of neutron coincidence counters for high-mass plutonium samples. Menlove, H.O.; Dickinson, R.J.; Douglas, I.; Orr, C.; Rogers, F.J.G.; Wells, G.; Schenkel, R.; Smith, G.; Fattgh, A.; Ramalho, A. (Los Alamos National Lab., NM (USA)). Feb 1987. Contract W-7405-ENG-36. 47p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004769.

Five different neutron coincidence systems were evaluated and calibrated for high-mass PuO_2 samples. The samples were from 2 to 7.2 kg of PuO_2 in mass, with a large range of burnup. This report compares the equipment and the results, with an evaluation of deadtime and multiplication corrections.

16648 (LA-UR—86-4387) The Low-Q Diffractometer at the Los Alamos Neutron Scattering Center. Seeger, P.A.; Williams, A.; Trewhella, J. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 12p. (CONF-8609234—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003763.

From International collaboration on advanced neutron sources ↑; 0.

Instrument criteria are presented for the Low-Q Diffractometer (LQD) at the Los Alamos Neutron Scattering Center (LANSCE), and a design is shown to meet these criteria. The collimator consists of multiple-aperture pinhole plates, and incorporates "dynamic gravity focusing" to center all wavelengths on the detector. Preliminary test results, making use of the Proton Storage Ring, a liquid hydrogen moderator, and two different position-sensitive detectors are shown.

16649 (PTB-Dos—14) New dose quantities for personnel dosemeters. Results of the intercomparison program 1985 - seminar report. Boehm, J.; Piesch, E.; Regulla, D. (eds.). (Fachverband fuer Strahlenschutz e.V., Karlsruhe (Germany, F.R.). Arbeitskreis Dosismessung Externer Strahlung; Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Gruppe Strahlenschutzmetrologie). Jun 1986. 327p. (In German). (CONF-8511235—; FS—86-38-AKD). NTIS (US Sales Only), PC A15/MF A01. File Number DE87750519.

From Seminar on new dose quantities for personnel dosemeters - results of the intercomparison program 1985; Braunschweig, F.R. Germany (26 Nov 1985).

In 1985, the Workshop External Dosimetry (AKD) of the German-Swiss 'Fachverband fuer Strahlenschutz' and the Physikalisch-Technische Bundesanstalt (PTB) organized an intercomparison experiment in order to find out whether commonly used personal dosemeters are able to indicate the new ICRU dose quantities (ICRU 39) H/sub s/ (0,07) and H/sub p/(10) recommended for personal dosimetry. A total number of 30 representative dosimetry systems participated at the interlaboratory test. These systems make use mainly of L and RPL dosemeters, but also film dosemeters and direct reading dosemeters have been chosen. The irradiations have been performed over the energy range 25-662 keV using irradiations free in air as well as on the ICRU sphere phantom. Under an angle of 0/sup 0/, 45/sup 0/ and on the rotating phantom. The

effect of phantom type has been investigated using the ICRU sphere and the Alderson human phantom. With respect to the ICRU quantities, three categories of personal dosemeters have been found dosemeter systems which simultaneously indicate the exposure X as well as H'(0,07) and H'(10) without any change of the evaluation technique or energy compensation filter, dosemeter systems which must be improved either in the evaluation procedure or by using additional detector readings, and dosemeter systems which must be changed in the energy compensation filters. In different papers the participants discuss their own results. Additional contributions of the seminar are presented, which discuss general subjects of introducing new dose quantities and other concepts of calibration quantities for external dosimetry.

16650 **Using a cyclotron plus ECR source for detector evaluation and calibration.** McMahan, M.A.; Wozniak, G.J.; Lyneis, C.M.; Bowman, D.R.; Charity, R.J.; Liu, Z.H.; Moretto, L.G.; Kehoe, W.L.; Mignerey, A.C.; Namboodiri, M.N. (Lawrence Berkeley Lab., CA, USA. Nuclear Science Div.; Maryland Univ., College Park, USA. Dept. of Chemistry; Lawrence Livermore National Lab., CA, USA. Nuclear Chemistry Div.). *Nuclear Instruments and Methods in Physics Research;* 253: No. 1, 1-9(15 Dec 1986). Contract AC03-76SF00098.

A technique is described to quickly measure the response of detectors to intermediate-energy heavy ions. An ECR source was utilized to produce ions as heavy as krypton. A series of ions with the same charge-to-mass ratio was accelerated in a cyclotron to a constant velocity or energy/nucleon. Different ion species were extracted by adjusting the resonant frequency a few kHz. Detectors were directly exposed to the extracted beams. For a charge-to-mass ratio of one-quarter, over seventeen ion species from /sup 4/He/sup +1/ to /sup 84/Kr/sup +21/ were observed in a two hour period.

16651 **High-rate CAMAC aquisition system.** Belshe, R.A.; Lee, M.K. (Lawrence Berkeley Lab., CA, USA). *Nuclear Instruments and Methods in Physics Research;* 253: No. 1, 65-72(15 Dec 1986). Contract AC03-76SF00098.

The High Energy Resolution Ball (HERB) consists of 21 bismuth-germanate shielded germanium detectors, clustered in three rings. In the center of the cluster is a 40 element bismuth-germanate ball which functions as a sum spectrometer and a multiplicity filter. The purpose of the system is to measure the energy, multiplicity, and correlations of gamma rays emitted from a target located in the center of the ball. This paper describes the data acquisition hardware and software which was developed to support this apparatus. The high data rates generated are handled by two levels of FIFO buffering in CAMAC hardware. Also of interest is the method of calibrating the individual analog input channels. The software obtains calibration information from the incoming experimental data and sets up a special CAMAC module which dynamically adjusts the gain and offset of each input channel.

16652 **X-ray position detection in the region of 6 μm RMS with wire proportional chambers.** Fischer, J.; Radeka, V.; Smith, G.C. (Brookhaven National Lab., Upton, NY, USA). *Nuclear Instruments and Methods in Physics Research;* 252: No. 2/3, 239-245(1 Dec 1986). (CONF-860272—). Contract AC02-76CH00016.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

We have developed a MWPC system for X-ray detection with a position resolution in the region of 6 μm rms (14 μm fwhm). The performance with argon, krypton or xenon at pressures from 1 to 10 atm is explored for the X-ray energy range 5-25 keV. At a resolution of 6 μm rms the effects of photoelectron and Auger electron range, electronic noise, avalanche spread, lateral electron diffusion, as well as X-ray beam collimation, become of comparable magnitude. Their limiting effects on avalanche centroid fluctuation, and hence on position resolution, are investigated. The position resolution achieved in this work compares favorably with that of solid state devices.

16653 **New drift chamber for the Mark II detector at the SLAC linear collider.** Hanson, G.G. (Stanford Linear Accelerator Center, CA, USA). *Nuclear Instruments and Methods in Physics Research;* 252: No. 2/3, 343-349(1 Dec 1986). (CONF-860272—). Contract AC03-76SF00515.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

A new central drift chamber has been constructed for the Mark II detector for use at the new SLAC Linear Collider. The design of the new chamber is based on a multi-sense-wire cell of the jet-chamber type. In addition to drifttime measurements, pulse-height measurements from the sense wires provide electron-hadron separation by dE/dchi. The chamber has been installed in the detector and is being tested at PEP before being moved to the SLC. The design and construction of the chamber, as well as initial performance results from the PEP data, are presented.

16654 **Development of high pressure proportional counters.** Oddone, P.; Smith, G.; Green, A.; Nemethy, P.; Baksay, L.; Schick, L.; Heflin, E.G. (Lawrence Berkeley Lab., CA, USA; New York Univ., NY, USA; Union Coll., Schenectady, NY, USA; Dallas Univ., Irving, TX, USA). *Nuclear Instruments and Methods in Physics Research;* 252: No. 2/3, 458-460(1 Dec 1986). (CONF-860272—).

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

We have begun to investigate the possibility of operating gas counters at high pressures. In a first step we were able to operate cylindrical chambers up to 430 atm with a gas gain of about 300 using a mixture of 92% Ar and 8% CH/sub 4/.

16655 **Detection of charged particles in amorphous silicon layers.** Perez-Mendez, V.; Morel, J.; Kaplan, S.N.; Street, R.A. (Lawrence Berkeley Lab., CA, USA; Xerox Palo Alto Research Center, CA, USA). *Nuclear Instruments and Methods in Physics Research;* 252: No. 2/3, 478-482(1 Dec 1986). (CONF-860272—). Contract AC03-76SF00098.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

Also published as report LBL--20664; CONF-860272--7; CONF-8603109--2.

The successful developemnt of radition detectors made from amorphous silicon could offer the possibility for relatively easy construction of large area position-sensitive detectors. We have conducted a series of measurements with prototype detectors, on signals derived from alpha particles. The measurement results are compared with simple model calculations, and projections are made of potential applications in high-energy and nuclear physics.

16656 **Review of wire chamber aging.** Va'vra, J. (Stanford Linear Accelerator Center, CA, USA). *Nuclear Instruments and Methods in Physics Research;* 252: No. 2/3, 547-563(1 Dec 1986). (CONF-860272—). Contract AC03-76SF00515.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

Also published as report SLAC-PUB--3882; CONF-860162--2.

This paper makes an overview of the wire chamber aging problems as a function of various chamber design parameters. It emphasizes the chemistry point of view and many examples are drawn from the plasma chemistry field as a guidance for a possible effort in the wire chamber field. The paper emphasizes the necessity of tuning of variables, the importance of purity of the wire chamber environment as well as it provides a practical list of presently known recommendations. In addition, several models of the wire chamber aging are qualitatively discussed. The paper is based on a summary talk given at the Wire Chamber Aging Workshop held at LBL, Berkeley on January 16-17, 1986. Presented also at Wire Chamber Conference, Vienna, February 25-28, 1986.

16657 Drift-pots for small angle elastic scattering at the Fermilab collider. Amos, N.; DeSalvo, R.; Orear, J.; York, T.; Baker, W.; Eartly, D.; Lennox, A.; Pruss, S.; Bertani, M.; Giacomelli, G. (Cornell Univ., Ithaca, NY, USA; Fermi National Accelerator Lab., Batavia, IL, USA). *Nuclear Instruments and Methods in Physics Research;* **252**: No. 2/3, 263-266(1 Dec 1986). (CONF-860272—).

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

In order to measure the small angle p-anti p scattering at the Fermilab Tevatroncollider we developed very small drift chambers integrated with thin-wall roman pots. We named them drift-pots. The drift-pots are active 100 μm from the vacuum of the beam with an expected resolution of 60 μm in the drift direction and 250 μm in charge division. They are radiation resistant detectors intrinsically insensitive to the beam pickup pulses and their multiple hit readout capability will allow us to push them into the beam halo where p-anti p Coulomb elastic scattering dominates. For our application, we believe the drift-pots, are superior to state of the art silicon detectors.

16658 Performance of the SLD central drift chamber prototype. Atwood, W.B.; Chadwick, G.; Hansl-Kozanecka, T.; Nielsen, B.S.; Prescott, C.Y.; Rochester, L.S.; Young, C.C.; Carr, J.; Nauenberg, U.; Csorna, S. (Stanford Linear Accelerator Center, CA, USA; Colorado Univ., Boulder, USA. Dept. of Physics and Astrophysics). *Nuclear Instruments and Methods in Physics Research;* **252**: No. 2/3, 295-298(1 Dec 1986). (CONF-860272—). Contract AC03-76SF00515.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

Also published as report SLAC-PUB--3910; CONF-860272--6.

A two-cell prototype of the SLD central drift chamber has been tested using CO/sub 2/-isobutane (92%-8%) at 1 atm. Average single wire resolution of 55 μm was achieved. Charge division tests indicate a resolution of the final design of < or approx. 0.5% of wire length. dE/dchi separation of π/e should be useful up to at least 7 GeV/c. 100 MHz waveform digitizers were used in parallel with conventional timing and integration techniques. The results show equivalent performance for single tracks and a two pulse resolution better than 1 mm.

16659 Prototype results of a high resolution vertex drift chamber for the Mark II SLC upgrade detector. Alexander, J.; Hayes, K.; Hoard, C.; Hutchinson, D.; Jaros, J.; Odaka, S.; Ong, R.; Drell, P.; Fuzesy, R.; Harr, R. (Stanford Linear Accelerator Center, CA, USA). *Nuclear Instruments and Methods in Physics Research;* **252**: No. 2/3, 350-356(1 Dec 1986). (CONF-860272—).

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

Also published as report SLAC-PUB--3889; CONF-860272--2; LBL--21158.

Test results from a full-length prototype of the drift chamber vertex detector for the Mark II SLC Upgrade detector are presented. The 22 cell jet chamber employs planes of grid wires above and below the sense wire plane to increase the electrostatic stability of the sense wires and to narrow the electron arrival time distribution. Two different grid designs have been investigated. The spatial resolution and pulse widths have been measured at a variety of operating points and for different timing schemes in a mixture of 92% CO/sub 2/ and 8% isobutane. Typical results at 3 atmospheres pressure give an average resolution over a 2 cm drift distance of 30 μm for both designs. Efficient double track detection is achieved for tracks separated by 500 μm for one design and by 1000 μm for the other.

16660 Performance of a novel silicon detector. Beuttenmuller, R.; Kraner, H.W.; Ludlam, T.W.; Polychronakos, V.A.; Radeka, V.; Chesi, E.; Fabjan, C.W.; Piuz, F.; Russ, J.S.; Tschulik, A. (Brookhaven National Lab., Upton, NY, USA; European Organization for Nuclear Research, Geneva, Switzerland). *Nuclear Instruments and Methods in Physics Research;* **252**: No. 2/3, 471-477(1 Dec 1986). (CONF-860272—).

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

The performance of a silicon detector with two-dimensional pad readout, intended to be used in the trigger of experiment HELIOS (NA34), has been investigated in a proton/pion beam of 200 GeV/c momentum at the CERN SPS. The data can be described by the convolution of the Landau distribution with a Gaussian, taking into account long distance collisions and electronics noise. Uniformity in peak loss was found to be better than 7%. The response for single tracks through the detector is characterized by the total number of pads with a threshold value (multiplicity), and the number of adjacent pads, responding to a single particle (cluster size). Data on multiplicity and cluster size as a function of threshold will be discussed. Detection efficiency for particles has been measured over the pad area and across the pad boundaries.

16661 Development and testing of a Monte Carlo code system for analysis of ionization chamber responses. Johnson, J.O.; Gabriel, T.A. (Univ. of Tennessee, Knoxville). *Transactions of the American Nuclear Society;* **53**: 408-409(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In the field of radiation dosimetry, it is often necessary to establish an accurate correlation between incident radiation and an observed response to derive such quantities as radiation exposure, energy transfer, or absorbed dose. The correlation depends on the characteristics of the radiation, the irradiated material, and the detection device. Ideally, the detector does not perturb the interactions between the radiation and the material, and translates the interactions into an observable response in a known and reproducible manner. In practice, the detector does perturb the interactions and this perturbation must be quantified as part of the detector's response. To predict these perturbations, a differential Monte Carlo computer code system entitled MICAP - a Monte Carlo Ionization Chamber Analysis Package - was developed and tested at Oak Ridge National Laboratory. This code system determines the neutron, photon, and total response of an ionization chamber to mixed-field radiation environments. Because of the statistical nature of the physical processes involved in detecting radiation using ionization chambers, the stochastic Monte Carlo method is expected to model dosimetry experiments accurately and eliminate limitations inherent in approximate methods.

16662 Two-source method for determining radiation counting dead time. Wehring, B.W.; Mani, K.V. (North Carolina State Univ., Raleigh). *Transactions of the American Nuclear Society;* **53**: 59-60(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper examines two approximations used for the two-source method of dead-time determination in radiation counting experiments. One or the other of these two approximations is given in most textbooks that deal with radiation detection. It is shown here that the less-often-quoted approximation is more accurate than the more quoted one. An interpretation for the poorer of the two approximations, however, is also given, which indicates that it may be useful.

16663 Status of in-plant neutron coincidence counting. Ensslin, N.; Krick, M.; Menlove, H.; Stewart, J. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 147-148(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Neutron coincidence counters are used in nuclear material processing plants to assay bulk quantities of plutonium or uranium. Passive assays of plutonium are often made with the High-Level Neutron Counter (HLNC or HLNC-II), the Dual-Range Coincidence Counter, or customized detector geometries. Active assays of uranium are often made with the Active Well Coincidence Counter or the Uranium Neutron Coincidence Collar. Modern counters may have flattened efficiency profiles, fast AMPTEK amplifier/discriminators mounted directly next to the ^{3}He detection tubes, external background shields, or special sample-loading mechanisms. Typical counting times and accuracies that can be obtained for plutonium

are summarized. If isotopic composition is known, large plutonium samples can be assayed in 100 to 200 s - comparable to the time requires to input sample data into the counter's calculator or computer.

16664 **Calibration of neutron correlation counters by calorimetry and gamma-ray measurements.** Rakel, D.A. (Monsanto Research Corp., Miamisburg, OH). *Transactions of the American Nuclear Society;* **53**: 148-149(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The use of transportable calorimeters and gamma-ray isotopics systems for in-field assay of plutonium for safeguard purposes is well established. The authors have coupled the use of calorimetric assay with neutron correlation counting. The combination has been used in five in-field measurement exercises on a variety of sample types. The results of the measurements are presented, and different approaches to the analysis and interpretation of the data are discussed. With the increase in the number of gamma-ray measurements required to support calorimetry and neutron counting, an improvement in the gamma-ray through-put was required. The in-field gamma-ray assay system was modified to accommodate commercially available high count rate (~50-kHz) acquisition of gamma-ray spectral data. The use of this equipment and its impact on calorimetric assay are also presented.

16665 **Hybrid Monte Carlo/analytical model of neutron coincidence counting.** Stewart, J.E. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 149-151(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Design of neutron coincidence counters and interpretation of nondestructive nuclear material measurements made with them have been guided by neutron transport calculations. An analog Monte Carlo model in which neutron counts were processed by a simulated shift-register circuit was used to analyze a dual-ring thermal-neutron coincidence counter. This approach resulted in a modified version of the Los Alamos MCNP code. A simpler method (also based on MCNP) was used to calculate coincidence self-multiplication correction factors for passive assay of PuO_2 samples. The latter approach assumed a known detector response function that depended on the multiplicity distribution of neutrons escaping the sample. The simple or correction factor model was also adopted for calculations of active assay measurements of uranium-bearing samples.

16666 **Measuring the third factorial moment; application to neutron correlation assay.** Zucker, M.S. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society;* **53**: 151-152(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Several electronic schemes have been devised to accomplish the assay of nuclear material using neutron pulse train correlation analyses. The ones that have emerged as the most successful and widely accepted are those evolved along the lines of the so-called Boehnel circuit. The operation of the Boehnel circuit in its present generic form is illustrated. The presence of three physically independent parameters [(f,n), (α,n), and multiplication] thus requires a corresponding knowledge of three independent parameters of the P/sub v/ distribution of the sample. This information could be furnished by the third factorial moment $\langle v(v-1)(v-2)\rangle$, as has been widely recognized. Several methods of obtaining this from a pulse train have been proposed; the present paper shows how an extension of the Boehnel circuit will yield this quantity.

16667 **Accidental-coincidence corrections.** DeVolpi, A. (Argonne National Lab., IL). *Transactions of the American Nuclear Society;* **53**: 152-153(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

In neutron coincidence counting, as in all other time-coincidence counting, corrections must usually be made for accidental (chance) coincidences, which are a function of instrument parameters, such as count rates, dead time, resolving time, and correlations. A study of three effects has confirmed that the traditional corrections were significantly in error, and a relatively simple and logical exact correlation has been deduced. Because neutron coincidence counting has been important in such applications as nuclear safeguards, time-of-flight measurements of neutron spectra (by delayed coincidences), and measurements of the absolute yield of neutrons from ^{252}Cf, the implications of this discrepancy are widespread.

16668 **Rejection of outliers in thermal neutron coincidence counting.** Goldman, A.S.; Krick, M.S. (Los Alamos National Lab., NM). *Transactions of the American Nuclear Society;* **53**: 153-154(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

The collection and analysis of data thermal neutron coincidence counters (TNCCs) with small computers for nuclear safeguards measurements are increasingly common, particularly for field applications in the International Atomic Energy Agency. In general, these data have not been statistically tested for outliers (observations that stand apart from the bulk of the data). The goal of this work is to provide statistically sound techniques for detecting outliers in TNCC data that can functions automatically in portable computers such as the IBM-PC-compatible computers.

16669 **Advances in the use of ^3He in gas scintillation counters.** Behrens, J.W.; Hongchang, M.; Wasson, O.A. (National Bureau of Standards, Washington, DC). *Transactions of the American Nuclear Society;* **53**: 163(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

For several decades it has been suggested that the $^3He(n,p)T$ reaction should be utilized for detecting neutrons over the entire range from thermal to MeV energies. In fact, this reaction has been suggested as a possible standard. The reaction has a Q value of 764 keV and is easily detected in both a gas proportional counter (GPC) and gas scintillation counter (GSC). The use of ^3He in GPC's is rather common today; however, its use in GSC's is rare, in spite of the improved timing resolution available from the latter. A possible reason for this is the sensitivity of the ultraviolet (uv) photons to trace organic impurities in the gas. At the National Bureau of Standards (NBS), the authors constructed a $^3He/Xe$ GSC which operated for over two years on its original high-purity gas fill without any continuous gas purification. This step marks a significant advance toward the possible standardization of the $^3He(n,p)T$ reaction.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 15273, 15285, 15376, 15633, 16430, 16725, 16795, 16812, 16916, 16977, 17342

16670 **(CEA-CONF—8461) Utilisation of image intensifiers used in conjunction with streak cameras.** Cavailler, C. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). May 1986. 35p. (In French). (CONF-8605110—4). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750445.

From OPTO '86 conference; Paris, France (13 May 1986).

After a presentation of the method suitable to measure the image intensifier performance we will demonstrate the advantages of double proximity focused MCP image intensifiers over electrostatic MCP and simple proximity focused diode intensifiers. We will then present some applications of image intensifiers in High Speed Photography: chronometry measurements in detonics, picosecond streak camera for temporal analysis of laser pulse shapes in laser matter interaction experiments electronic image readout of streak tubes by CCD.

16671 **(FEI—1663) Memory division module MDP.2.** Andriashin, A.V.; Mil'shin, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700698.

A division mechanism of a recording working memory device situated in the crate of an autonomous measuring site and performed in KAMAK standard is described. Interactions of functional assemblies of memory division module MDP.2, being the base of the whole mechanism, are described in detail. A block-diagram of MDP.2 as well as a list of instructions and formats of control registers are presented. 1 ref.; 4 figs.

16672 **(JINR—13-85-734) Reaction of hybrid circuit on the magnetic flux perturbation.** Kiselev, Yu.F.; Chernikov, A.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700767.

Submitted to the journal Zh. Tekh. Fiz. .

Generalized expressions are obtained for sensitivity and relative frequency detuning of the Q-meter, Robinson's generator and squid. Influence of the cable length on the Q-meter sensitivity in measurements of the constant field value was experimentally studied at room temperature. Influence of the attenuation coefficient of a cable section between the mixing chamber and the evaporation chamber on the value and distortion of the NMR signal from deuterons was investigated at superlow temperatures. A criterion for estimating distortions was symmetry of nuclear susceptibility - at the quadrupole interaction - to the inversion with respect to the centre at the sign change of the deuteron spin temperature. The experiments confirm the theory well and lead to a conclusion that a superconducting cable may increase sensitivity and reduce distortions of the signal shape. 11 refs.; 6 figs.; 1 tab.

16673 **(N—87-13362) Space infrared telescope facility wide field and diffraction limited array camera (IRAC). Semi-annual status report, 1 March-31 August 1986.** Fazio, G.G. (Smithsonian Astrophysical Observatory, Cambridge, MA (USA)). Oct 1986. 69p. (NASA-CR—177041; NAS—1.26:177041; SASR—4). NTIS, PC A04/MF A01.

IRAC focal plane detector technology was developed and studies of alternate focal plane configurations were supported. While any of the alternate focal planes under consideration would have a major impact on the Infrared Array Camera, it was possible to proceed with detector development and optical analysis research based on the proposed design since, to a large degree, the studies undertaken are generic to any SIRTF imaging instrument. Development of the proposed instrument was also important in a situation in which none of the alternate configurations has received the approval of the Science Working Group.

16674 **(WAPD-TM—1616) An automated two-dimensional laser velocimeter system.** Ibrahim, B.B.; Hammond, R.B. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Feb 1987. Contract AC11-76PN00014. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005625.

This document describes a laser velocimeter - minicomputer data acquisition system that is used in the measurement of fluid velocity. An automated traversing mechanism is also described. The data collection, processing, calculation and display of velocity plots in real-time is the principal feature of this system.

16675 **Tube wall thickness measurement apparatus.** Lagasse, P.R. (to Dept. of Energy, Washington, DC). US Patent 4,633,590. 6 Jan 1987. Filed date 21 Jun 1985. vp.

An apparatus is described for measuring the thickness of a tube's wall for the tube's entire length and circumference by determining the deviation of the tube wall thickness from the known thickness of a selected standard item, the apparatus comprising: a. a base; b. a first support member having first and second ends, the first end being connected to the base, the first support member having a sufficiently small circumference that the tube can be slid over the first support member; c. a spherical element, the spherical element being connected to the second end of the first support member. The spherical element has a sufficiently small circumference at its equator that the tube can be slid over the spherical element, the spherical element having at its equator a larger circumference than the first support member; d. a second support member having first and second ends, the first end being connected to the base, the second support member being spaced apart form the first support member; e. a positioning element connected to and moveable relative to the second support member; and f. an indicator connected to the positioning element and being moveable thereby to a location proximate the spherical element. The indicator includes a contact ball for contacting the selected standard item and holding it against the spherical element, the contact ball contacting the tube when the tube is disposed about the spherical element. The indicator includes a dial having a rotatable needle for indicating the deviation of the tube wall thickness from the thickness of the selected standard item, the rotatable needle being operatively connected to and responsive to the position of the contact ball.

16676 **Optical fiber inspection system.** Moore, F.W. (to Dept. of Energy, Washington, DC). US Patent 4,635,111. 6 Jan 1987. Filed date 5 Apr 1985. vp.

A remote inspection apparatus is described for optically inspecting exterior surfaces of objects, comprising: an enclosure; at least one inspection head mounted within the enclosure for receiving a supply of objects to be inspected; the inspection head having an object passageway extending downwardly thereinto, through which objects being inspected pass; collimating means for orienting the objects into a desired orientation for passage through the inspection head; transparent window means forming a section of the object passageway; lens means arranged circumferentially about the window means for gathering and transmitting light reflected from surfaces of the objects; light guide means receiving an optical image from the lens means and for conveying the optical images therethrough; a television camera for converting optical image conveyed by the light guide means into electronic signals representative of the optical images; signal processing means for integrating the electronic signals for producing a singular image of an object; a television monitor for converting the electronic signal into a visible image representative of surfaces of the objects; staging means for stationarily positioning an object within the window means so that exterior surfaces of the object can be viewed by the lens means; and light source guides adjacent to the window means for beaming light onto objects positioned upon the staging means.

16677 **Fiber optic moisture sensor with moisture-absorbing reflective target.** Kirkham, R.R. (to Dept. of Energy, Washington, DC). US Patent 4,634,856. 6 Jan 1987. Filed date 3 Aug 1984. vp.

A method is described for monitoring environmental moisture changes, comprising the following steps: locating an optical fiber assembly within the environmental area being monitored; transmitting light signals through the optical fiber assembly from a light source to and from a target whose reflectance is a function of the target's moisture content; measuring the returned light reflected by the target; and detecting changes in the light signals transmitted through the optical fiber assembly from the light source as an indication of the moisture conditions to which the optical fiber assembly is subjected.

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 15347

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

16678 **(LA-UR—87-78) Modeling of buried explosions.** Gaffney, E.S.; Wohletz, K.H.; House, J.W.; Brown, J.A. (Los Alamos National Lab., NM (USA)). 1987. Contract W-7405-ENG-36. 15p. (CONF-870374—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004500.

From International symposium on the interaction of conventional munitons with protective structures; Mannheim, F.R. Germany (9 Mar 1987).

Los Alamos National Laboratory has been and continues developing techniques for modeling buried explosions using a large geotechnical centrifuge. When fully developed, the techniques should permit the accurate modeling of large explosions in complex geometries. Our intentional application is to study the phenomena of explosive cavity formation and collapse. However, the same methods should also be applicable to simulation of bursts shallow enough to produce craters, and perhaps even of airbursts in situations where soil overburden is important. We have placed primary emphasis on test bed construction methods and on accurate measurement of the ground shock produced by the explosions. 8 refs., 7 figs.

16679 **(SAND—86-2553C) An integral model of plume rise from high explosive detonations.** Boughton, B.A.; DeLaurentis, J.M. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 19p. (CONF-870816—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004517.

From Thermal hydraulics of severe nuclear reactor accidents/national heat transfer conference joint conference; Pittsburgh, PA, USA (9 Aug 1987).

A numerical model has been developed which provides a complete description of the time evolution of both the phyiscal and thermodynamic properties of the cloud formed when a high explosive is detonated. This simulation employs the integral technique. The model equations are derived by integrating the three-dimensional conservation equations of mass, momentum and energy over the plume cross section. Assumptions are made regarding (1) plume symmetry; (2) the shape of profiles of velocity, temperature, etc. across the plume; and (3) the methodology for simulating entrainment and the effects of the crossflow induced pressure drag force on the plume. With these assumptions, the integral equations can be reduced to a set of ordinary differential equations on the plume centerline variables. Only the macroscopic plume characteristics, e.g., plume radius, centerline height, temperature and density, are predicted; details of the plume intrastructure are ignored. The model explicitly takes into account existing meteorology and considers the alterations in plume behavior which occur when aqueous form is used as a mitigating material. The simulation was tested by comparison with field measurements of cloud top height and diameter. Predictions were within 25% of field observations over a wide range of explosive yield and atmospheric stability. 12 refs., 4 figs. 1 tab.

16680 **Short pulse initiation of detonation in a TATB explosive.** Dick, J.J.; Wackerle, J.D. (Los Alamos National Lab., Los Alamos, NM). pp 172 of Proceedings of the twenty-first symposium (international) on combustion. Pittsburgh, PA; Combustion Institute (1986). (CONF-860804—).

From 21. international symposium on combustion; Munich, F.R. Germany (3 Aug 1986).

Detonation of a plastic-bonded triaminotrinitrobenzene explosive PBX 9502 was initiated by planar, short-shock pulses of an amplitude of 13.1 GPa and durations of 0.16 to 0.64 μs. In-material particle velocity vs time histories were obtained using the axisymmetric magnetic probe, and shock front trajectories were measured in wedge experiments.

4502 Nuclear

REFER ALSO TO CITATION(S) 15666, 15668, 16162, 17677

16681 **(AD-A—174003/4/XAB) Inversion for source parameters of underground nuclear explosions with implications for yield estimation. Technical report, 5 September 1985-5 March 1986.** Barker, J.S.; Burger, R.W.; Burdick, L.J.; Lay. (Woodward-Clyde Consultants, Pasadena, CA (USA)). 15 Mar 1986. 130p. (WCCP-R—86-01). NTIS, PC A07/MF A01.

The first part of this report presents a method for simultaneous inversion of near-field explosion wave forms for parameters of the source and structure. The inversion automatically provides information on the trade-offs between parameters and error analyses of the resultant models. The source may be parameterized by any of several effective source functions. The structure is parameterized as a layered stack of gradients defined by the velocity at the top of the layer, the velocity gradient within the layer, and the depth to the top of the layer. The gradient model is then discretized into homogeneous plane layers, with the layer thickness defined as the wavelength of the predominant period in the data, and synthetics are computed using asymptotic generalized ray theory. For each observed wave form, the residuals consist of the normalized cross-correlation coefficient between the data and synthetics, the difference in normalization factors, and the time lag to the peak of cross-correlation. The second part of the report addresses the implications of choosing a particular representation of the RDP on the determination of teleseismic attenuation. This time-domain analysis is based on a near-field to far-field amplitude comparison. The near-field amplitude information is contained in the parameters of the explosion-source model, assuming amplitude information is contained in the parameters of the explosion-source model and assuming either the Mueller-Murphy or Helmberger-Hadley representations.

16682 **(DOE/ER/25009—388) Hypercube tracking: A preliminary status report.** Gottschalk, T.D.; Angus, I.G.; Fox, G.C. (California Inst. of Tech., Pasadena (USA)). 1985. Contract FG03-85ER25009;AC03-81ER40050. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005026.

This document summarizes completed activities and progress in the Caltech campus/JPL Hypercube tracking program as of 1 December 1986. The initial problem under investigation concerns track initiation for a 50 object threat during the first 100 seconds after launch. For multi-object launches from a single site, the principal initial difficulty is track is equivalent to hit association in a dense environment. Sequential and parallel programs which perform this track initiation task have been completed and are described in this note. Simple illustrations of performance on the hypercube are presented. A "menu" for possible, near future activities is also included. 6 refs., 9 figs.

16683 **(UCRL—95026-Rev.2) Nuclear explosives for peaceful purposes.** Borg, I.Y. (Lawrence Livermore National Lab., CA (USA)). Nov 1986. Contract W-7405-ENG-48. 33p. (CONF-8610136—3-Rev.2). NTIS, PC A03/MF A01; GPO Dep. File Number DE87002552.

From SIPRI/CLIPS study on a comprehensive test ban; Ottawa, Canada (23 Oct 1986).

The US Plowshare program, designed to develop peaceful uses of nuclear explosives, was vigorous between 1957-73 and was of concern during US and USSR nuclear treaty negotiations within that period. In order to accommodate possible future applications, the Peaceful Nuclear Explosions Treaty was signed in 1976. The US program explored the phenomenology of nuclear explosions and tested their use in industrial applications. Due to waning industrial interest and public concern over environmental issues, the US program was terminated in 1977. The Soviet counterpart to the Plowshare program, which has involved more than 100 experiments throughout the USSR, continued until the self-imposed moratorium in 1985. As any peaceful use of nuclear explosives has the potential of furthering weapons research, the US takes the position that all such experiments would have to be banned in a comprehensive test ban treaty. 24 refs.

16684 **(UCRL—95825) Nuclear weapon R and D and the role of nuclear testing.** Brown, P.S. (Lawrence Livermore National Lab., CA (USA)). 12 Dec 1986. Contract W-7405-ENG-48. 5p. (CONF-870124—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003815.

From General meeting of the American Physical Society; San Francisco, CA, USA (28 Jan 1987).

There are four fundamental reasons why we do nuclear tests: (1) to maintain confidence in the existing stockpile; (2) to modernize the stockpile for improved safety, security, survivability, and military effectiveness; (3) to assess the vulnerability of weapons to the nuclear threat environment posed by the weapons of our adversaries; and (4) to avoid technological surprise by maintaining the

scientific judgment necessary to understand the limits of weapon potential. These four are individually discussed.

4503 Explosion Detection

16685 **(UCRL—95155-Rev.1) On the degree of verification needed to support a comprehensive test ban.** Kidder, R.E. (Lawrence Livermore National Lab., CA (USA)). Dec 1986. Contract W-7405-ENG-48. 16p. (CONF-8610136—2-Rev.1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87004353.

From SIPRI/CLIPS study on a comprehensive test ban; Ottawa, Canada (23 Oct 1986).

The military significance of nuclear explosive tests is discussed and illustrated with the aid of the recent (1980 through 1984) US nuclear testing record. It is concluded that nuclear tests with yields that are but a small fraction of a kiloton are militarily significant, particularly for purposes of nuclear weapons research. These could be conducted in fully decoupled seismically quiet, reusable cavities, and would be well below the threshold of reliable detection and identification by seismic or other means presently under consideration. For this reason it is concluded that the degree of verification needed to support a CTB is not available at the present time. A Threshold Test Ban with explosive yields limited to five kilotons, as proposed by Defense Secretary Harold Brown, appears to present a much more realistic near-term possibility.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 16421, 16747

16686 **(KFK—4123) Report on the comparison of measurements between two monostatic Doppler-SODAR's manufactured by REMTECH.** Zimmer, J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Meteorologie und Klimaforschung). Aug 1986. 58p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87750508.

The measurement data obtained by SODAR, viz. horizontal and vertical wind velocity, wind direction, as well as standard deviations of these values, have been compared with the corresponding data from the meteorological tower of the KfK. The correlation coefficients are discussed. In addition the availability of both units are compared. The final version of the SODAR apparatus is characterized by correlation coefficients from wind velocity and direction as well as from the vertical component, which are larger by 2-9%. The correlation of the standard deviation of the wind direction is small (0.1-0.5) for both units and was not discussed any further. The largest improvement was observed when comparing the drop-out time. Missing data of the final SODAR unit were much less frequent as compared to the results from the first test unit, especially for data taken above 200 m. For the maximum height of 420 m the improvement was about 60%.

16687 **(KFK—4124) Influence of stability classification on atmospheric diffusion calculations for elevated releases over a terrain of major roughness.** Hu Erbang; Thomas, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Meteorologie und Klimaforschung; Ministry of Nuclear Industry, Taiyuan, SX (China). Inst. of Radiation Protection). Aug 1986. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750511.

A series of atmospheric tracer experiments with 100 m release height have been performed at the KfK over a terrain of major roughness. The concentration data of the tracers are used to validate the Gaussian plume model if the following methods of stability classification are used: Standard deviation of the vertical wind direction observed at 100 m height, standard deviation of the horizontal wind direction observed at 40 and 100 m heights as recommended by the USNRC, temperature differences between 30 and 100 m heights and 2 and 100 m heights as recommended by the USNRC. Different sets of dispersion parameters are applied in the Gaussian plume model: recommended by IAEA and derived from the KfK tracer data used in the validation. In this case the five methods of stability classification mentioned above are applied to derive the dispersion parameters. The validation is based on a linear regression analysis between the calculated and observed logarithms of the normalized diffusion factor and on the ratios of the calculated and observed normalized diffusion factors. The results demonstrate that the most qualified method of stability classification is that based on the standard deviation of the vertical wind direction. The method based on the standard deviation of the horizontal wind direction is better than those relying on the temperature differences. The dispersion parameters derived from the tracer concentrations used in the validation procedure yield slightly better results than those recommended by IAEA.

16688 **(KFK—4126) Evaluation of tetroon flights and turbulent diffusion under weak wind conditions during the field experiment SIESTA.** Hu Erbang; Vogt, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Meteorologie und Klimaforschung; Ministry of Nuclear Industry, Taiyuan, SX (China). Inst. of Radiation Protection). Aug 1986. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750510.

During several days in November 1985 an international field experiment took place in the Swiss plateau region near the cities of Aarau, Olten. As indicated by the name of the project SIESTA (SF/sub 6/ International Experiments in Stagnant Air) its aim is to obtain knowledge of the general nature of turbulence advection and atmospheric dispersion processes in a cold pool with very low wind speed and undefined wind direction. An outline of the general concept of the project is followed by a more detailed description of a special research activity with Radar tracked tetroons. In the second part of the report it is shown how to determine the horizontal dispersion parameter from the trajectories of the tetroon flights. Two different methods are described and the results of the flights performed during SIESTA are presented.

16689 **(NDP—002) Tree ring chronology indexes and reconstructions of precipitation in Central Iowa, USA.** Blasing, T.J.; Duvick, D.N. (Oak Ridge National Lab., TN (USA)). Sep 1984. Contract AC05-84OR21400. 3p. Oak Ridge National Lab., TN (USA).

Over sixty trees were sampled at each of the three Iowa sites; at least two cores were taken from most of the trees. The growth rings of each core were dated by calendar year, following standard procedures. Ring widths were measured to the nearest one-hundredth of a millimeter. Low-frequency variations resulting from tree age, changes in competitive status, and other nonclimatic factors were minimized by fitting a spline curve to the ring-width series and dividing each ring width by the value of the curve for the corresponding span. The average adjusted ring-width index for each year was computed from the indices of all cores at a site to obtain the chronology of ring-width indices (or tree ring chronologies) presented here. Based on the oldest tree samples, the initial years of the three chronologies in the study were 1635 at Pammel, 1654 at Duvick Back Woods, and 1663 at Ledges, Iowa. The sample sizes of the chronologies ranged from 6 to 16 cores by the year 1680 and increased steadily in each chronology after 1800. Indices are included for the three sites through 1981. A reconstruction of annual precipitation for central Iowa for the period 1860-1979 is based on these three chronologies.

16690 **(NDP—003) Surface air temperature anomalies for the Northern Hemisphere, 1881 - present.** Wigley, T.M.L.; Jones, P.D.; Kelly, P.M. (East Anglia Univ. (UK). Climatic Research Unit). Sep 1984. Contract AC05-84OR21400. vp. East Anglia Univ. (UK). Climatic Research Unit.

This report contains monthly and seasonal averages of surface air temperature anomalies obtained from a 5° x 5° gridded data base of surface air temperatures. Anomalies for the Arctic region are also included.

16691 **(NDP—008) Seasonal tropospheric and stratospheric temperature anomalies for the Northern Hemisphere, 1958-1983.** Angell, J.F.; Korshover, J. (National Oceanic and Atmospheric Administration, Silver Spring, MD (USA)). Sep 1984. Contract AC05-84OR21400. vp. National Oceanic and Atmospheric Administration, Silver Spring, MD (USA).

This report contains seasonal temperature-anomaly data for five atmospheric layers and the surface in five climatic zones both hemispheres, and the world.

16692 **(NDP—011) Global paleoclimatic data for 6000 yr B.P.** Webb, T. III. (Brown Univ., Providence, RI (USA)). Aug 1985. Contract AC05-84OR21400. vp. Brown Univ., Providence, RI (USA).

Pollen, lake level, and marine plankton data for the Holocene period (6000 yr B.P.) are documented in 53 datasets. The data are subdivided into nine groups by data type and geographic region for the pollen and marine plankton data types. Bibliographic citations associated with each site are included.

16693 **(NDP—012) Climatic data for Northern Hemisphere land areas 1851-1980.** Bradley, R.S.; Kelly, P.M.; Jones, P.D.; Goodess, C.M.; Diaz, H.F. (Massachusetts Univ., Amherst (USA); East Anglia Univ. (UK). Climatic Research Unit). Aug 1985. Contract AC05-84OR21400. vp. Massachusetts Univ., Amherst (USA).

Monthly temperature and precipitation data for stations in the Northern Hemisphere through 1980 are presented. This compilation of long term climatic data extends the World Weather Records database by ~ 700 temperature stations and ~ 1200 precipitation stations.

16694 **(NDP—014) Solar records: the Wolf sunspot index and umbral/penumbral ratio.** Hoyt, D.V. (National Oceanic and Atmospheric Administration, Boulder, CO (USA)). Aug 1985. Contract AC05-84OR21400. vp. National Oceanic and Atmospheric Administration, Boulder, CO (USA).

Annual Wolf sunspot numbers and umbral/penumbral (U/P) ratios are given for the period 1875-1981. The data are summarized from daily values and are as accurate a reconstruction as can be presently made.

16695 **(NDP—016) Climatic data for selected US and Canadian stations 1941-1980.** Karl, T.R.; Quinlan, F. (National Oceanic and Atmospheric Administration, Asheville, NC (USA)). Sep 1985. vp. National Oceanic and Atmospheric Administration, Asheville, NC (USA).

Monthly mean temperature and total precipitation data for 130 selected stations in the United States and Canada are given. Minimum and maximum monthly mean temperatures, as well as range of mean temperature are also included. The data are based on daily values.

16696 **Last pluvial climatic episodes in the deserts of southwestern North America.** Spaulding, W.G.; Graumlich, L.J. (Univ. of Washington, Seattle). *Nature (London);* **320**: No. 4, 441-444(3 Apr 1986).

Long-term variations in the effective moisture of deserts are linked both to glacial-interglacial climatic cycles and, through the Milankovitch theory, to orbitally induced changes in solar radiation intensity. For southwestern North America, comparison of paleobotanical data with model predictions of paleoclimate reveals two distinct pluvial regimes during the late Wisconsin and early Holocene (23-8 kyr BP). Southward displacement of the Aleutian low-pressure center and strengthened westerlies from ~ 40° to 30°N were important features of the full-glacial (~ 18 kyr BP) pluvial maximum. Increased cyclonic storms and weakened monsoons led to a winter precipitation regime a feature seen both in the fossil record and climate models. Dominantly zonal flow during this period contrasts with the latest Wisconsin and early Holocene (12-8 kyr BP), when meridional circulation transported maritime tropical air into the desert interior. They now show that plant macrofossil assemblages from packrat (Neotoma spp.) middens in the Mojave Desert provide evidence for increased temperatures and summer rainfall during this period. The anomalously late persistence (to ~ 8 kyr BP) of woodland in low-latitude, low-elevation deserts of the south-west is attributed to enhanced monsoonal circulation.

16697 **Geographical distribution and seasonality of persistence in monthly mean air temperatures over the United States.** Van Den Dool, H.M.; Klein, W.H.; Walsh, J.E. (Univ. of Maryland, College Park). *Monthly Weather Review;* **114**: 546-560(Mar 1986). Contract AS05-81EV10539.

Eighty years of monthly mean station temperatures are used to evaluate the persistence of monthly air temperature anomalies over the US. The geographical and seasonal dependencies of the monthly persistence are described in terms of the day-to-day persistence of temperature anomalies, the influence of the large-scale atmospheric circulation, and inferred associations with slowly varying properties of the earth's surface. The monthly persistence is generally smallest in the continental interior and largest in coastal regions. The seasonality of this spatial pattern is quite small, although the continental interior is characterized by a summer maximum. For the country as a whole, persistence is highest (0.30) in winter and summer and least (0.15) in fall and spring. For both raw and detrended data, the anomaly pattern correlations at lags of two and three months are much larger than would be expected from a first-order Markov process. The pattern of persistences computed using day-to-day autocorrelations shows that the presence of nearby bodies of water increases the month-to-month persistence over that to be expected from daily weather fluctuations. This finding is consistent with the results derived from an intuitive energy balance model in which the soil (or ocean) surface layers and the atmospheric boundary layer respond to prescribed daily fluctuations in the free atmosphere. Local surface influences are also implied by the fact that the 700-mb circulation-derived anomalies of monthly temperature have fewer spatial degrees of freedom than do the actual anomalies. While the large-scale circulation accounts for about half of the winter temperature persistence, small-scale effects, as well as the effects of the antecedent month's circulation, contribute substantially to the persistence of summer temperatures. 26 references, 13 figures, 3 tables.

16698 **Light diffusion through clouds and haze.** Max, N.L. (Lawrence Livermore National Lab., CA). *Computer Vision, Graphics, and Image Processing;* **33**: 280-292(1986). Contract W-7405-ENG-48.

This paper describes an algorithm for approximating the single scattering model for light diffusion through clouds or haze of constant optical density. The clouds are contained between two single valued surfaces. The algorithm assumes that the sun is directly overhead, but gives convincing pictures for other sun directions. Its efficiency comes from approximating the exponential decay of transmitted light by a quadratic polynomial, and from vectorization on the Cray 1.

16699 **January and July simulations with a spectral general circulation model.** Pitcher, E.J.; Malone, R.C.; Ramanathan, V.; Blackmon, M.L.; Puri, K.; Bourke, W. (Univ. of Miami, FL). *Journal of the Atmospheric Sciences;* **40**: 580-604(Mar 1983).

The authors describe the results of January and July simulations carried out with a nine-level spectral model, employing a rhomboidal truncation at wavenumber 15. Sea-surface temperature, sea-ice distribution and solar zenith angle are held constant in each simulation. The model includes interactive clouds and radiative processes after Ramanathan et al. Selected fields are shown which highlight the model's strengths and weaknesses. The latitude-height distribution of the zonal wind is successfully simulated. The model captures the separation between the wintertime westerly jets in the troposphere and stratosphere and thus simulates the sign reversal in the vertical wind shear across the jet axis in the upper troposphere. In addition to the zonal wind, they show also the zonally averaged temperature, meridional wind and vertical velocity. Regional distributions of sea-level pressure, surface air temperature, precipitation and a number of other fields defined at various pressure levels are compared in detail with observations. For the most part, the large-scale features of the observed general circulation are successfully simulated, although the sea-level pressure in the subtropics over continental regions in the wintertime is higher than observed, and

the model atmosphere tends to be a few degrees colder than observed. They offer a partial explanation for this last deficiency. There is good agreement between the model stratosphere and the actual stratosphere. Preliminary indications suggest the variability present in the model is comparable to that found in the atmosphere.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 15315, 15316, 15317, 15753, 16208, 16235, 16773, 16777, 16781, 16783, 16905, 16906, 16930

16700 **(CMP—002) IEA/ORAU long-term global energy-CO_2 model.** Edmonds, J.A.; Reilly, J.M. (Oak Ridge Associated Universities, Inc., TN (USA)). Aug 1984. Contract AC05-84OR21400. vp. Oak Ridge Associated Universities, Inc., TN (USA).

The IEA/ORAU Long-Term Global Energy-CO_2 Model is a mathematical model which makes projections concerning global energy and CO_2 emissions at 25-year intervals beginning in 1975 to the year 2100. These projections are based on economic, demographic, and energy interactions. The model consists of four parts: supply, demand, energy balance, and CO_2 emissions. Energy demand is a function of the population, economic activity, technological change, energy prices, and energy taxes and tariffs existing in each of nine global regions. The nine global regions include the following: the United States, Canada and Western Europe, OECD Pacific (Japan, Australia, and New Zealand), USSR and Eastern Europe, Centrally Planned Asia (China, et. al.), Middle East, Africa, Latin America, and South and East Asia. These regions may be altered by the user. Supply is dependent upon resource constraints, behavioral assumptions, and energy prices for the various regions. Energy balance brings the global energy supply and demand for fuels into balance. CO_2 emissions are determined by applying appropriate carbon coefficients (carbon release per unit of energy) at the points in the energy flow where carbon is released. The IEA/ORAU Long-Term Energy-CO_2 Model computes regional and world energy quantity outputs, energy prices, costs of production, and carbon emission results.

16701 **(CONF-840851—5) Global energy and carbon dioxide.** Reilly, J.; Edmonds, J. (Institute for Energy Analysis, Washington, DC (USA)). 26 Aug 1984. Contract AC05-76OR00033. 6p. NTIS, PC A02. File Number DE87004896.

From 2. IMACS symposium on energy modeling and simulation; Upton, NY, USA (26 Aug 1984).

The literature on energy and carbon dioxide (CO_2) emissions is reviewed and a brief overview of recent work using the IEA/ORAU long-term energy CO_2 model is given. It was designed to provide forecasts of carbon emissions explicitly based to energy and economic factors. Recent work has focused on developing three emissions scenarios; the extreme scenarios are presented as bracketing the range of likely future emissions rates. Ongoing work will use Monte Carlo techniques to assess uncertainty in future forecasts and attribute uncertainty to uncertainty in model assumptions and parameters. The paper concludes that the model and scenario construction exercises should serve to complement decisionmaking and interaction among scientists and policymakers.

16702 (EPRI-CS—4918-Vol.3, pp 20.1-20.16) **Identification, assessment, and control of fugitive particulate emissions.** Cowherd, C. Jr.; Kinsey, J.S.; Harmon, D.L. (Midwest Research Institute, Kansas City, MO). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The US Environmental Protection Agency (EPA) has funded the preparation of a technical guidance document for the identification, assessment, and control of fugitive particulate emissions. The purpose of this document is to assist control agency personnel in evaluating fugitive emissions control plans and to assist industry personnel in the development of cost-effective control strategies. The document describes procedures for developing a cost-effective strategy for the control of fugitive particulate emissions within any specific plant or geographic setting. Also, it provides sources of data or, in some cases, the actual data needed to implement the procedures, along with fully worked examples. This paper summarizes the content of the above guidance document. Although a variety of control techniques applicable to sources of fugitive particulates are discussed, control efficiency values are specified only for those control options which have been tested for effectiveness. Also, greater emphasis is placed on open dust sources than on process sources. This is consistent with the larger body of available data on the performance of open dust source controls. Finally, procedures for the determination of control costs and cost-effectiveness are summarized, and cost elements are described for the major generic classes of fugitive controls. 10 references, 1 figure, 6 tables.

16703 (EPRI-CS—4918-Vol.3, pp 21.1-21.21) **Process fugitive particulates - design methods for enclosures.** Goodfellow, H.D.; Cesta, T.; Kashdan, E.R.; Coy, D.W.; Spivey, J.J.; Harmon, D.L. (Hatch Associates, Ltd., Toronto, Ontario). Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

Regulatory officials charged with the responsibility of reviewing hood systems for capture of process fugitive emissions face a difficult task. A manual has been prepared to provide these officials with a reference guide on the design and evaluation of hood systems and enclosures. This paper presents design methods for enclosures. In particular, enclosures for inertial process fugitive sources and for buoyant sources are discussed. Equations are given to estimate the required exhaust rate for the enclosures. Mechanical design considerations are listed for enclosures applied to buoyant sources. 5 references, 3 figures.

16704 (EPRI-CS—4918-Vol.3, pp 22.1-22.16) **Field evaluation of windscreens as a fugitive dust control measure for materials storage piles.** Zimmer, R.A.; Axetell, K. Jr.; Ponder, T.C. Jr. Nov 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI87920155. (CONF-860213—Vol.3).

From 6. symposium on the transfer and utilization of particulate control technology; New Orleans, LA, USA (25 Feb 1986).

The Air and Energy Engineering Research Laboratory (AEERL) has instituted a coordinated program for development of a technology for the control of fugitive particle sources. The AEERL has identified windscreens as a promising control technique for one of the major sources - storage piles. Before this technology can be effectively applied, however, application criteria need to be developed. These criteria include (1) screen porosity, (2) screen width, (3) screen height, and (4) the distance between the screen and the pile. AEERL and the Environmental Sciences Research Laboratory (ESRL) have completed an in-house study designed to determine changes in windspeed (not changes in emissions) due to windscreens. The ESRL wind tunnel was used in experiments conducted to determine the optimal windscreen porosity, size, and location. Before this information could be applied to the design of windscreens, it was necessary to conduct a field study to validate the wind tunnel studies with respect to windspeed changes, and to determine the relationship between changes in windspeed and changes in fugitive dust emissions. During the summer of 1985, testing was performed simultaneously on two cone shaped piles of shredded topsoil 8 feet high and having a base diameter of 25 feet. One pile was exposed and the other was controlled with a 50% porosity windscreen. Sensors were located at the surface of each pile to determine windspeed. Exposure profiling towers with samplers at four heights were used to determine total particulate emissions. Windspeed data were collected continuously by an onsite computer. Profiler data were averaged for a complete test and selected filters were subjected to laser diffraction analysis to obtain particle size data. 13 references, 2 figures, 2 tables.

16705 **(N—87-11857) HALOE science investigation. Semiannual progress report, February-July 1986.** Benner, D.C. (College of William and Mary, Williamsburg, VA (USA)). 1986. 4p. (NASA-CR—179825; NAS—1.26:179825). NTIS, PC A02/MF A01.

The Halogen Occulation Experiment (HALOE) gas response test simulations were completed using the HALOE spectroscopic

instrument model. A new series of programs were written for routine repetitive runs of the spectroscopic model to make it more user friendly for certain studies. Some of the limitations of the model were eased for atmospheric studies. Atmospheric signal profiles were calculated for inclusion in the electronic model programs. Analysis of additional spectral bands of CO_2 in the 3 micron region was continued. A program of measurement of the air broadened halfwidths of spectral lines in the nu (sub 3) fundamental band of CH_4 was started and over 40 lines measured.

16706 **(N—87-12059) Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986.** Gormsen, B.B.; Tiwari, S.N. (Old Dominion Univ., Norfolk, VA (USA)). Aug 1986. 9p. (NASA-CR—179882; NAS—1.26:179882). NTIS, PC A02/MF A01.

Highly efficient methods were developed for the analysis and reduction of Measurement of Air Pollution from Satellite (MAPS) data. Specific attention was directed to analyzing the data from the Office of Space and Terrestrial Applications 3 (OSTA-3) correlative measurements of aircraft research flights and from the OSTA-3 shuttle flight. Methods were developed for error analysis of the aircraft and spacecraft instruments. The LSI 11/23 software system was modified and expanded for future data analysis.

16707 **(N—87-13022) Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid.** Remsberg, E.E.; Kurzeja, R.J.; Haggard, K.V.; Russell, J.M. III; Gordley, L.L. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Dec 1986. 73p. (NASA-TP—2625; L—16136; NAS—1.60:2625). NTIS, PC A04/MF A01.

The Nimbus 7 Limb infrared monitor of the stratosphere (LIMS) data set has been processed into a Fourier coefficient representation with a Kalman filter algorithm applied to profile data at individual latitudes and pressure levels. The algorithm produces synoptic data at noon Greenwich Mean Time (GMT) from the asynoptic orbital profiles. This form of the data set is easy to use and is appropriate for time series analysis and further data manipulation and display. Ozone and nitric acid results are grouped together in this report because the LIMS vertical field of views (FOV's) and analysis characteristics for these species are similar. A comparison of the orbital input data with mixing ratios derived from Kalman filter coefficients indicates errors in mixing ratio of generally less than 5 percent, with 15 percent being a maximum error. The high quality of the mapped data was indicated by coherence of both the phases and the amplitudes of waves with latitude and pressure. Examples of the mapped fields are presented, and details are given concerning the importance of diurnal variations, the removal of polar stratospheric cloud signatures, and the interpretation of bias effects in the data near the tops of profiles.

16708 **(NDP—001) Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983.** Keeling, C.D. (California Univ., San Diego, La Jolla (USA)). Sep 1984. Contract AC05-84OR21400. 3p. California Univ., San Diego, La Jolla (USA).

Carbon dioxide concentrations have been obtained throughout the sampling period using a nondispersive, dual detector, infrared gas analyzer. Air samples are obtained via air intakes at the top of 7m towers. Four of these towers exist, along with a 27m tower. The highest intake along with one of the lower intakes take four samples per hour. Air is sampled from one intake for 10 minutes, then from the second for 10 minutes, and then from a reference gas for 10 minutes. The intakes are actually maintained continuously, but are shunted when not being analyzed by the infrared gas analyzer. The air flow registers a voltage on the analyzer which then records the concentrations on a strip chart recorder. Two intakes are used to detect possible contamination. A sign of contamination, whether ambient or instrument, is evidenced by significant differences in CO_2 concentrations between the two paired intakes. Efforts to calibrate equipment, reduce the possibility of contamination, and to adjust data to represent uncontaminated, true conditions have been done and updated throughout the course of the project. Calibration of the gas analyzer by standardized CO_2-in-nitrogen reference gases is done twice daily. Flask samples are taken twice monthly to give a comparison to the data recorded using the infrared gas analyzer. Data is scrutinized daily for possible contamination and archived and magnetic tape for possible further scrutiny and adjustment. Daily, monthly, and annual averages are computed for the Mauna Loa data after deletion of con taminated samples and readjustment. These averages have shown a steady rise in the annual average concentration, from 316 ppmv in 1959 to 342 ppmv in 1983.

16709 **(NDP—004) Transient Tracers in the Oceans (TTO) hydrographic data and carbon dioxide systems.** (Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.)). Sep 1984. Contract AC05-84OR21400. 3p. Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.).

The Transient Tracers in the Ocean (TTO) study was an experiment to investigate the manner and time scale of ocean mixing, as deduced from the distribution of radiochemical tracers injected into the atmosphere and then the oceans, in the time period 1958-1962 from nuclear bomb tests. These observations, with careful investigation of oceanic CO_2 properties, provide unique constraints on oceanic uptake of fossil fuel CO_2. The experiment followed a four year plan: preparation, calibration and test cruise (1980), field work (1981), laboratory analysis (1982) and completion, data analysis and reporting (1983).

16710 **(NDP—017) Major world ecosystem complexes ranked by carbon in live vegetation: a database.** Olson, J.S.; Watts, J.A.; Allison, L.J. (Oak Ridge National Lab., TN (USA)). Sep 1985. Contract AC05-84OR21400. vp. Oak Ridge National Lab., TN (USA).

Estimation of the inventory of carbon in major world ecosystems and of the exchanges with the atmosphere and other major reservoirs has thus been approached in two ways. In the major reservoirs has thus been approached in two ways. In the first approach, development of broad global patterns uses potential vegetation maps, or associates vegetation types with climatic or other environmental factors independent of local disturbance. In the second approach, development of modern regional or stand-type estimates is based on analyses of current vegetation and land-use practices. This method uses updated resource maps of natural vegetation, forestry surveys, agricultural yields, and human and economic as well as geopolitical considerations. Both approaches were applied in the development of the ecosystem map. The personal judgment of experts about ecosystem types, their locations and extent, and likely biomass or carbon in landscape complexes representative of different parts of the world is crucial in either approach.

16711 **(NP—7770063) Study including experiments on the diffusion emissions caused by accidents.** Hahn, W. (Stuttgart Univ. (Germany, F.R.)). 25 Feb 1985. 198p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE87770063.

To perform the study on the diffusion behaviour of pollutant clouds, soot was released from several pressure vessels to simulate real emissions due to an accident. The clouds thus created were registered by photographic means in northern Germany to a distance of up to 1936 m from the source of emission. To determine the position of the cloud, photographic registration took place from several angles. The quantitative assessment of the cloud photograms was done through the use of a digital image analyzing system. From the cloud photograms the average mass distribution of the soot within the cloud was determined. From the mass distribution curves were statistically derived: scatter parameters for wind, horizontal and vertical direction.

16712 **(PB—86-210598/XAB) Air quality data - 1985 annual statistics including summaries with reference to standards. Annual report.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Sep 1986. 379p. (EPA—450/4-86/008). NTISMF A01.

See also PB85-214237; Microfiche copy only (one sheet of 48X reduction.

The report presents comprehensive summaries of data produced by the Nation's ambient air-quality monitoring activities for 1985. The data are summarized in two formats: frequency distributions (Part I) and status of data with reference to standards (Part II). These summaries are based on data acquired through extensive monitoring activities conducted by federal, state, and local pollution-control agencies and submitted to the U.S. Environmental Protection Agency's National Aerometric Data Bank. Information is provided on the six pollutants for which National Ambient Air Quality Standards have been set: total suspended particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and ozone.

16713 **(PB—87-108395/XAB) Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon.** Clapp, D.E. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Jun 1984. 25p. (IWS—134-14). NTIS, PC A02/MF A01.

Industrial hygiene data were collected during a reproductive health study of workers exposed to 2-ethoxyethanol (2EE) at Precision Castparts Corp. Portland, Oregon. Air concentrations of 2EE were high, most likely as a consequence of the nature of the investment-casting process. Twenty two of 27 personal air samples exceeded 5 parts per million (ppm), with an average of 10.7 ppm. All environmental measurements were below the prevailing OSHA Permissible Exposure Limit of 200 ppm. Persistent, detectable concentrations of ethoxyacetic-acid (EAA), a suspected major metabolite of 2EE, were found in urine samples from exposed workers but not in samples from unexposed subjects. The author concludes that urinary monitoring can be used for assessing exposure to 2EE, particularly if there is skin exposure. The author recommends a follow-up reproductive health study to judge impairment of reproductive function. 2EE use has been discontinued at this facility. As the process was not changed, the substitute solvent may be rapidly vaporized into the air resulting in high concentrations that must be evaluated.

16714 **(PB—87-109591/XAB) Interlaboratory study of benzene stability of tedlar bags. Final report.** Shikiya, J.; Daymon, D.; Tsou, G.; Imada, M. (California State Air Resources Board, Sacramento (USA)). Sep 1984. 45p. (ARB/HS—86/01). NTIS, PC A03/MF A01.

A study was initiated to determine the long-term stability of benzene vapors stored in Tedlar (polyvinyl fluoride) bags because the Air Resources Board and other air-monitoring agencies have adopted the technique of using these bags to collect samples. Many times, due to the analytical work load in the organic analysis laboratory, these samples may have to wait a number of days before their analysis can be performed. To validate the results, it was necessary to determine the stability of benzene in these bags. The Sampling Technique and Analysis Methods Subcommittee of the Toxic Air Monitoring Technical Advisory Committee (TAMTAC) proposed a study at concentrations of ambient and source levels (10-50 ppb and 5-20 ppm). The average concentration of the ambient range (10-50 ppb) of benzene vapor was 98.5% of the initial concentration after seventy-two hours of storage in the Tedlar bags and, after 150 hours, the average concentration was 92.3% of the initial value. The average concentration of the source level (5-20 ppm) average of the initial concentration was 96% after seventy-two hours and 92.5% after 150 hours.

16715 **(PB—87-110482/XAB) Characterization of stack emissions from municipal refuse-to-energy systems. Final report.** Howes, J.E.; Kohler, D.F.; DeRoos, F.L.; Riggin, R.M.; Barbour, R.L. (Battelle Columbus Labs., OH (USA)). Oct 1986. 104p. NTIS, PC A06/MF A01.

Stack emissions from three municipal refuse-to-energy systems were characterized: refuse-derived fuel (RDF), mass burning (MASS), and modular (MOD). A comprehensive set of measurements was performed at each site to determine the physical and chemical properties of the particulate and gaseous stack emissions. The physical characterization included measurement of the mass concentration and size distribution of the stack particulate matter. Inorganic chemical characterization of the stack emissions included determination of the elements, anions, and compounds present in the fly ash, measurement of gaseous HCl and HF emissions, and determination of volatile trace-element levels. The characterization of organic materials in the stack emissions included specific measurements for polynuclear aromatic hydrocarbons (PAH), tetrachlorinated dibenzo-p-dioxins (TCDD) and dibenzofurans (TCDF), and aldehydes. Screening analyses were performed to provide tentative identification of organic compounds in the stack emissions.

16716 **(PB—87-110961/XAB) Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory.** Karaffa, M.; Amick, R.; Crone, A.; Zimmer, C. (PEI Associates, Inc., Cincinnati, OH (USA)). Oct 1986. 78p. NTIS, PC A05/MF A01.

Air sampling was conducted at an EPA office building which had undergone an asbestos abatement program. The aggressive sampling technique revealed that air-entrainable asbestos remained in work areas after completion of abatement actions. The ratio of aggressive-to-nonagressive PCM fiber concentrations was 7.0, whereas this ratio was 3.7 for TEM analyses. Study results also confirm that, under similar sampling conditions, TEM analysis detects more fibers than PCM because of TEM's better resolving capability. The ratio of TEM/PCM concentrations for nonagressive sampling was 3.0 for ambient samples and 3.3 for indoor samples; the ratio for agressive sampling was about 2. Because the PCM method does not discriminate between asbestos and other fibers, and cannot resolve fibers thinner than about 0.2 micrometer, PCM results may not accurately reflect the true hazard potential.

16717 **(PB—87-111134/XAB) Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982.** Greiner, G.P.; Smith, J.K.; Ross, J.M.; McKenna, J.D. (ETS, Inc., Roanoke, VA (USA)). Sep 1986. 51p. NTIS, PC A04/MF A01.

The report gives results of an evaluation of gas-to-cloth (G/C) ratios and a variety of fabrics in baghouses controlling particulate emissions from coal-fired industrial boilers. Procedures for increasing the G/C ratio were evaluated in a pulse-jet baghouse. A second baghouse of the same size, but with reverse-flush cleaning, was used to study several types of woven and felted fabrics. Typical of textile-plant boiler operations, the baghouses were subjected to fluctuating load requirements and frequent dewpoint excursions. Under these conditions, it was found that off-line high-energy pulse-jet cleaning was necessary for long term pressure drop stability at G/C ratios above 5. Cleaning energy was found to have a major effect on pressure-drop performance, but cleaning frequency registered an insignificant effect within the 6- to 20-minute range studied. Among fabrics, a new combination felted fabric, composed of Teflon and glass, showed excellent performance and stability under a long bag life.

16718 **(PB—87-111142/XAB) Hydroxyl-radical rate-constant intercomparison study. Final report.** Edney, E.O.; Corse, E.W. (Northrop Services, Inc., Research Triangle Park, NC (USA)). Oct 1986. 34p. NTIS, PC A03/MF A01.

An intercomparison study was conducted to evaluate the OH rate-constant measurement protocol developed by researchers at the University of California at Riverside. Researchers used the protocol to measure the room-temperature OH rate constants for ethane, benzene, chlorobenzene, and sec-butanol. The room-temperature OH rate constants determined by NSI-ES and UNC were in good agreement and also, with the exception of the previously unreported rate constant for sec-butanol, agreed with the literature values. Agreement was found using both methods of analysis. The rate constants for ethane, benzene, and chlorobenzene obtained by RTI using the time-excluded method also agreed with the literature values; however, when the same data were analyzed using the time-included method, no such agreement was found. It was not possible to identify the source of the discrepancy.

16719 **(PB—87-111332/XAB) Hanford 67-series: atmospheric field-diffusion measurements, micrometeorological and tracer data archive, Set 003 documentation report. Interim report.** Droppo, J.G. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1986. 56p. NTIS, PC A04/MF A01.

An archive for micrometerological and tracer-dispersion data was developed by Battelle, Pacific Northwest Laboratories for the U.S. Environmental Protection Agency. The archive is designed to make the results of extensive field tests readily accessible to EPA for model testing, development, and verification efforts. The report provides documentation for one volume of data sets, the Hanford 67-Series Atmospheric Dispersion Experiments. The entries in the documentation report are as follows: data set fact summary, narrative description of experiment and data, special information, references, description of archive data files, contacts (names, addresses, and phone numbers) and standard experiment summary table.

16720 **(PB—87-111720/XAB) Precision and accuracy assessments for state and local air-monitoring networks, 1984.** Rhodes, R.C.; Evans, E.G. (Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Monitoring and Systems Lab.). Aug 1986. 188p. (EPA—600/4-86/031). NTIS, PC A09/MF A01.

Precision and accuracy data obtained from state and local agencies during 1984 are summarized and compared to data reported earlier for the period 1981-1983. A continual improvement in the completeness of the data is evident. Improvement is also evident in the size of the precision and accuracy results reported. Annual results from each reporting organization are also given so that these organizations can compare their results for 1984 with their earlier results and with other organizations. A set of upper and lower limits for precision and accuracy is also proposed -- above these limits corrective action should be taken. A comparison of the precision and accuracy data from the Precision and Accuracy Reporting System and that from the independent performance audit program conducted by the Environmental Monitoring Systems Laboratory is given.

16721 **(PB—87-112330/XAB) Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter.** Eder, B.K. (Environmental Protection Agency, Research Triangle Park, NC (USA). Atmospheric Sciences Research Lab.). Oct 1986. 9p. (EPA—600/D-86/248). NTIS, PC A02/MF A01.

The REgional Lagrangian Model of Air Pollution (RELMAP) is a mass-conserving, regional-scale, Lagrangian model that simulates ambient concentrations as well as wet and dry deposition of SO_2, SO_4^{2-}, and more recently fine (diameters$<2.5\mu m$) and coarse ($2.5 <$ diameter $< 10.0\mu m$) particulate matter over the eastern third of the United States and southeastern Canada. The simulations of fine and coarse particulate matter, which involve simple parameterizations, were recently incorporated into the model in response to impending federal regulatory standards for inhalable particulate matter and the subsequent need for size discriminate models. These new parameterizations, which include the transformation of SO_2 into SO_4^{2-}, and the wet and dry deposition of fine and coarse particulate matter were allowed to vary within + or- 50% of their respective nominal values in order to determine the model's sensitivity to them. Future research should concentrate on refining the wet-deposition parameterizations, as they not only prove to be the most influential in the model's output, but they are also currently the least understood.

16722 **(PB—87-113221/XAB) Report on the parallel ambient sampling project for selected organic toxics. Final report.** Kowalski, J.; Shikiya, J.; Tsou, G.; Imada, M. (California State Air Resources Board, Sacramento (USA)). Sep 1986. 50p. (ARB/HS—86/02). NTIS, PC A03/MF A01.

All samplers were colocated and used in the same time frame, but there were differences in sample flow rates, sample volumes, and how the samples were collected (all the laboratories used bag samplers with Tedlar bags except the AIHL facility which used sorbent tubes with activated carbon). A comparison of the data shows good agreement considering the complexities of measuring low level (ppb and sub-ppb) ambient toxic compounds. Data conformity was achieved in spite of a lack of a traceable standard and the inexperience of some of the participants in measuring trace quantities. Trichloromethane was the only compound whose range of analytical results did not agree within one order of magnitude. The relative standard deviation for the other compounds ranged from 14 to 84 percent.

16723 **(PB—87-113783/XAB) Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report.** Allen, C.C.; Green, D.A.; White, J.B.; Coburn, J.B. (Research Triangle Inst., Durham, NC (USA)). Oct 1986. 150p. NTIS, PC A07/MF A01.

Methods for estimating emissions resulting from mass transfer of volatile organic compounds from dilute waste waters into air are reviewed and applied to full-scale and pilot-scale treatment systems.

16724 **(PB—87-113973/XAB) Locating and estimating air emissions from sources of ethylene oxide.** (Radian Corp., Durham, NC (USA)). Sep 1986. 80p. NTIS, PC A05/MF A01.

To assist groups interested in inventorying air emissions of various potentially toxic substances, EPA is preparing a series of documents such as this to compile available information on sources and emissions of these substances. The document deals specifically with ethylene oxide. Its intended audience includes federal, state, and local air-pollution personnel and others interested in locating potential emitters of ethylene oxide and in making gross estimates of air emissions therefrom. The document presents information on (1) the types of sources that may emit ethylene oxide, (2) process variations and release points that may be expected within these sources, and (3) available emissions information indicating the potential for ethylene oxide release into the air from each operation.

16725 **(PB—87-117156/XAB) Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation.** Liu, H.T.; Bachalo, W.D. (Flow Industries, Inc., Kent, WA (USA)). Oct 1984. 32p. (FLOW/TR—306/09-84). NTIS, PC A03/MF A01.

The feasibility of developing a particle-sizing instrument for in-situ measurements in industrial environments, based on the method of optical heterodyne or coherent detection, was investigated. The instrument, a coherent optical particle spectrometer, or COPS, is potentially capable of measuring several important particle parameters, such as particle size, number density, and speed, because of the versatility of the optical heterodyne method. Water droplets generated by an aerosol/particle generator were used to test the performance of the COPS. Study findings have shown that the optical setup of the COPS is extremely sensitive to even minute mechanical or acoustic vibrations. At the optimal setup, the COPS performs satisfactorily and has more than adequate signal-to-noise even with a 0.5 mW He-Ne laser.

16726 **(PB—87-117602/XAB) Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania.** Castellan, R.M. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). 1980. 30p. (NIOSH-TR-HHE—80-022-OC). NTIS, PC A03/MF A01.

Employee exposure to tea dust was evaluated for possible respiratory health effects. Personal and area airborne dust samples, taken along with area samples quantifying airborne fungi, and a noise survey comprised the tests run at the facility. The particle size distribution of the dust was such that much would be deposited in the nose and throat. This might explain the frequent upper respiratory problems experienced by Tetley workers. Airborne fungi concentrations were not directly related to gravimetric dust concentrations. According to the author, results suggest that health problems related to occupational exposure to tea dust, and possibly also to noise, exist among workers at the facility. Results also demonstrated the effectiveness of engineering controls for reducing potential work-place exposures in that the lowest fungal count was obtained nearby the tea-bag reclaiming process, which at the time was being conducted under a specially designed ventilation hood. Noise survey results indicated that recommended NIOSH levels were being exceeded in many instances.

16727 **(PB—87-118634/XAB) Results of 1984 architectural coatings sales survey. Final report.** Nyarady, J.F. (California State Air Resources Board, Sacramento (USA)). Jul 1986. 70p. (ARB/SS—86/03). NTIS, PC A04/MF A01.

In 1985 the California Air Resources Board (ARB) conducted a survey of architectural coatings sold in California in 1984. The survey asked for the 1984 sales in gallons, the organic solvent content in grams per liter, volume percent and weight percent solids, and recommended thinning for both water-borne and solvent-borne coatings in 37 categories. Over 140 manufacturers responded to the survey. The report presents in summarized form the information gathered by the survey. In addition, the report presents the possible emissions reductions that would be achieved if certain final photochemically reactive organic compound (PROC) limits were to go into effect limiting the amount of organic solvents manufacturers could use in their coatings. The report also presents limited information from a 1980 architectural coatings survey conducted by the ARB.

16728 (PB—87-122156/XAB) **Atmospheric-dispersion index for prescribed burning. Forest Service research paper.** Lavdas, L.G. (Forest Service, Asheville, NC (USA). Southeastern Forest Experiment Station). 14 Nov 1986. 39p. (FSRP-SE—256). NTIS, PC A03/MF A01.

A numerical index that estimates the atmosphere's capacity to disperse smoke from prescribed burning is described. The physical assumptions and mathematical development of the index are described in detail. The index is expressed as a positive integer in such a way that doubling the index implies a doubling of the estimated atmospheric capacity. The dispersion index is conceptually similar to ventilation factor but is better able to describe diurnal changes within the lower atmosphere. The index provides a guide to the effect of prescribed burning activity on atmospheric smoke concentration during a portion of a day.

16729 (PNL—5750-Pt.5, pp 1-6) **Effect of areal averaging on performance of a long-range acidic deposition.** Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

The Office of Environmental Analysis represents the Department of Energy's interests in the federal regulatory development process, maintains comprehensive environmental data bases, conducts anticipatory analyses for early identification and scoping of emerging regulatory issues, and provides environmental technical support and guidance to Departmental programs.

16730 **A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S.** Cheng, H.C.; Steinberg, M. (Process Sciences Div., Dept. of Applied Science, Brookhaven National Lab., Upton, NY). *Environmental Professional, The;* **5**: No. 4, 245-255(Nov 1986).

The increase in atmospheric CO/sub 2/ which results primarily from combustion of fossil fuels for energy, could cause dramatic global climatic and environmental changes-the so called "greenhouse effect." This study explores the technical feasibilities and the cost of controlling CO/sub 2/ emissions from the stacks by removing, recovering, and disposing of CO/sub 2/ from fossil-fuel power plants in the U.S. It is estimated that up to a 10% reduction in the annual incremental atmospheric CO/sub 2/ content would be achieved by the study control system. The total power required for such a control system ranges from 11 to 16% of the power-generating capacity in various regions of the U.S. Overall, the study system could essentially increase the capital investment of a power plant by 70 to 150%, and increase production cost of electricity by 56 to 100%, depending on the location of the plant.

16731 **Measuring dry deposition: a re-assessment of the state-of-the-art.** Hicks, B.B. (NOAA/ERL Air Resources Lab., Oak Ridge, TN, USA). *Water, Air, and Soil Pollution;* **30**: No. 1-2, 75-90(Sep 1986). (CONF-850944—).

From Muskoka conference: international symposium on acidic precipitation; Toronto, Ontario, Canada (15 Sep 1985).

The exchange process known as dry deposition encompasses the dynamic exchange of trace gases and aerosol particles, and the gravitational settling of large particles. Except for particles large enough that their sedimentation velocity exceeds turbulent velocities, the rate of deposition is mostly determined by surface properties, such as roughness, stickiness, and wetness, and by atmospheric stability. Thus, it is difficult to interpret results obtained using collection devices having surfaces different from those of nature. Other methods for measuring dry deposition exist, mostly micrometeorological, but these are sufficiently complicated that routine application as in a monitoring network is not yet feasible. For some chemical species and in some locations, inferential methods offer considerable promise. These methods measure atmospheric concentrations (C) of the relevant chemical species, and derive relevant deposition velocities (v/sub d/) on a site-specific, species-dependent, and time-evolving basis. The dry deposition rates of interest are then evaluated as the product v/sub d/.C. A major goal of current research programs is to provide the knowledge necessary to evaluate v/sub d/. Experimental methods are reviewed, and potential sources of error are examined, for both the research methods and the 'concentration monitoring' methodologies presently being advocated for use in numerical models as well as for routine monitoring. 36 refs.

16732 **Chemical composition of precipitation at Long Island, NY.** Lee, Y.N.; Shen, J.; Klotz, P.J. (Brookhaven National Lab., Upton, NY, USA). *Water, Air, and Soil Pollution;* **30**: No. 1-2, 143-152(Sep 1986). (CONF-850944—). Contract AC02-76CH00016.

From Muskoka conference: international symposium on acidic precipitation; Toronto, Ontario, Canada (15 Sep 1985).

Chemical analyses were performed on 387 sequential precipitation samples, both rain and snow, collected at Brookhaven National Laboratory, Long Island, New York, on 96 different days during the period from October 1983 to June 1985. The collection time for each individual sample was typically 30 min. The chemical species determined and the volume-weighted average and maximum concentrations were: H/sub 2/O/sub 2/, H/sub 2/CO, H/sup +/, NO/sub 3//sup -/, SO/sub 4//sup 2-/, NH/sub 4//sup +/, Ca/sup 2+/, Na/sup +/, and Cl/sup -/. A strong seasonal dependence was observed for H/sub 2/O/sub 2/ concentration, the maximum concentration in summer being 6 times greater than in winter. In addition, H/sub 2/O/sub 2/ concentration also exhibited a strong diurnal variation, with a maximum peaking in the afternoon and a minimum after midnight. These observations suggest that the production of H/sub 2/O/sub 2/ may be governed by photochemical activity. Nitrate concentration also displayed a strong diurnal variation, having a maximum around noon, but did not show a seasonal dependence. Relationships between various species and their possible sources are briefly discussed. 21 refs.

16733 **A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes.** Norton, S.A. (Maine Univ., Orono, USA). *Water, Air, and Soil Pollution;* **30**: No. 1-2, 331-345(Sep 1986). (CONF-850944—).

From Muskoka conference: international symposium on acidic precipitation; Toronto, Ontario, Canada (15 Sep 1985).

Inter-lake variation in accumulation rates of energy-related elements is a function of gross sedimentation rate (sediment focusing), position on pollution gradients, and water chemistry. Accumulation rates of Pb in lake sediments from profundal area cores in the Adirondack Mountains of New York and northern New England range from 0.1 to 0.2 ug/cm/sup 2//y (pre-1800 A.D.) to as much as 2 ug/cm/sup 2//y (recent sediment). Rates increase from the late 1800's to nearly the present, in parallel. Accumulation rates for V remain at background values which range up to 0.5 ug/cm/sup 2//y and increase 5 to 10 x background in Adirondack Mountain lakes. Chronically acidic lakes have a subsurface maximum. Of these three metals, only Pb has elevated deposition rates in high elevation lakes in the Rocky Mountains of Colorado. Mining activity is believed responsible for the implied air pollution there. 42 refs.

16734 **Detection of changes in the global troposphere temperature field induced by greenhouse gases.** Barnett, T.P. (Univ. of California, San Diego). *Journal of Geophysical Research;* **91**: No. D6, 6659-6667(20 May 1986). Contract AC03-76SF00098.

Several approaches to detecting the existence of a theoretically predicted CO_2-induced signal in the global temperature field are investigated. It appears that a relatively thin network of observing stations can, when properly analyzed, provide a first-order esti-

mate of global-scale temperature change and that this measurement is not necessarily the global average temperature. Using these stations, it is possible to estimate the strength of an a priori CO_2 signal in the three dimensional tropospheric temperature field. This signal is derived from two different general circulation model simulations, both with some form of interactive oceans. The observed signal strength over 1960-1980 is roughly 0.5-1.0 times that expected theoretically. The observed signal demonstrated a trend that is marginally significant.

16735 **Temperatures rise in the global greenhouse.** Gribbin, J. *New Scientist (London);* vp(15 May 1986).

By the end of the next century, the greenhouse effect may increase temperatures worldwide to levels that have not been reached for at least 100,000 years. And the effects on sea level and on agriculture and other human activities are likely to be so profound that they should be planning for them now. This is the gist of a major study of the potential climatic effects of the build-up of carbon dioxide in the atmosphere, carried out for the US Department of Energy, and just published as four reports.

16736 **Relationship between atmospheric CO_2 variations and a satellite-derived vegetation index.** Tucker, C.J.; Fung, I.Y.; Keeling, C.D.; Gammon, R.H. (NASA/Goddard Space Flight Center, Greenbelt, MD). *Nature (London);* 319: 195-199(16 Jan 1986). Contract AC05-84OR21400.

Estimates derived from satellite data of photosynthetically active radiation absorbed by terrestrial vegetation correlate with atmospheric carbon dioxide concentrations measured at surface recording stations, suggesting that satellite data can used to estimate terrestrial photosynthesis. 37 references, 4 figures, 1 table.

16737 **Changing carbon cycle: a global analysis.** Trabalka, J.R.; Reichle, D.E. (eds.). Oak Ridge, TN; Oak Ridge National Laboratory (1986). 600p.

An attempt is made to examine current knowledge about the fluxes, sources, and sinks in the global carbon cycle, as well as our ability to predict changes in atmospheric CO_2 concentration resulting from anthropogenic influences. The reader will find authoritative discussions of: past and expected releases of CO_2 from fossil fuels; the historical record and implications of atmospheric CO_2 increases; isotopic and geological records of past carbon cycle processes; the role of the oceans in the global carbon cycle; the influence of the world biosphere on changes in atmospheric CO_2 levels; and, evidence linking the components of the global carbon cycle.

16738 **General circulation model CO_2 sensitivity experiments: snow-sea ice albedo parameterizations and globally averaged surface air temperature.** Washington, W.M.; Meehl, G.A. (National Center for Atmospheric Research, Boulder, CO). *Climatic Change;* 8: 231-241(1986).

Two experiments are performed with the NCAR Community Climate Model (CCM) coupled to a swamp ocean with annually averaged solar forcing. A swamp ocean model is one in which the ocean temperature is computed from a surface energy balance. Both experiments are run with present (1 x CO_2) and doubled (2 x CO_2) amounts of atmospheric carbon dioxide (CO_2). The first tests the sensitivity of the model to a snow and sea-ice-albedo formulation which facilitates relatively greater ice melt. The second assesses the model response when the basic state of the model in the control run is colder due to a 2% decrease in solar constant. Both are compared to a previous experiment with the same model using a different snow and sea-ice-albedo formulation and the present value of the solar constant. It is found that the globally averaged surface air temperature increase due to a doubling of CO_2 is highly dependent on (1) the type of snow-sea-ice-albedo formulation used such that the parameterization which better facilitates relatively greater ice melt exhibits a greater sensitivity to increased CO_2, and (2) the basic state of the control run such that the colder the basic state, the greater the warming due to increased CO_2.

16739 **Carbon dioxide increase in the atmosphere and oceans and possible effects on climate.** Chen, C.T.A.; Drake, E.T. (Oregon State Univ., Corvallis). *Annual Review of Earth and Planetary Sciences;* 14: 201-235(1986). Contract AC05-84OR21400.

Scientists have been aware of the potential consequences of changes in the atmospheric CO_2 level for many decades. Late nineteenth century investigators were especially impressed by the impact of the Industrial Revolution on the level of atmospheric CO_2. Modern scientists are alert to the accelerated effects of the same trends resulting from society's effort to meet the needs of an ever-growing world population. While the interaction of all the various factors may have either a compounded impact or a canceling effect, it is clear that two main factors emerge as the crux of the problem: the continued use of fossil fuels, and the large-scale deforestation necessary to provide land for cultivation of food.

16740 **Evaluation of gas data from high-temperature fumaroles at Mount St. Helens, 1980-1982.** Gerlach, T.M.; Casadevall, T.J. (Sandia National Labs., Albuquerque, NM). *Journal of Volcanology and Geothermal Research;* 28: 107-140(1986). Contract AC04-76DP00789.

The Mount St. Helens fumarole gases show linear composition trends during periods of noneruptive degassing between September 1980 and October 1981. The trends are characterized by increasing H_2O and decreasing CO_2 and sulfur. Maximum fumarole temperatures also show a linear decrease during this period. High-temperature fumarole gases collected from the crater and dome between September 1980 and July 1982 are all H_2O-rich (> 90%) with 1-10% CO_2 and small amounts of H_2S, SO_2, H_2, CO, HC, and HF. Trace amounts of COS and S_2 are present, and occasional observations of minor CH_4 appear to result from contamination or low-temperature reactions in sample vessels. The O_2 fugacities of the gases remain near Ni-NiO during cooling. The low sulfur content of the gases obviates the need for extensive gas-rock oxygen exchange to maintain f/sub O_2/'s near Ni-NiO. A detailed thermodynamic analysis of 50 gas samples collected between September 1980 and December 1981 led to improved compositions for 22 samples. The gases were initially in a state of equilibrium, but disequilibrium modifications from atmospheric oxidation of H_2 and, to a lesser extent, CO occurred within the upper portions of the fumarole vents. The last temperatures of equilibrium for the fumarole gases range from 800°C to 650°C and are nearly always higher than the collection temperatures. No evidence was found of disequilibrium admixture of surface waters; if such modifications of the fumarole gases occurred, the water must have been added at depth and have reequilibrated with the other gas species at magmatic or near-magmatic temperatures.

16741 **Changing carbon cycle: a global analysis.** Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). 574p. (CONF-8310436—). Springer-Verlag, 175 Fifth Avenue, New York, NY 10010.

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

An attempt is made to examine current knowledge about the fluxes, sources, and sinks in the global carbon cycle as well as the ability to apply this knowledge to the prediction of changes in atmospheric CO_2 concentration resulting from anthropogenic influences. The reader will find authoritative discussions of: past and expected releases of CO_2 from fossil fuels; the historical record and implications of atmospheric CO_2 increases; isotopic and geological records of past carbon cycle processes; the role of the oceans in the global carbon cycle; the influence of the world biosphere on changes in atmospheric CO_2 levels; evidence linking the components of the global carbon cycle. This important new book will provide scientists and environmental decision makers with a major source of current information and ideas on a topic that is not only the subject of intense scientific investigation but is also relevant to key societal issues. Separate abstracts are included for 26 chapters for inclusion in the data base.

16742 **Global atmospheric CO_2 distribution 1968-1983: interpretation of the results of the NOAA/GMCC measurement program.** Gammon, R.H.; Komhyr, W.D.; Peterson, J.T. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The modern period of precise atmospheric CO_2 measurements began with Keeling's pioneering determinations at Mauna Loa, Hawaii, and the South Pole during the International Geophysical Year. The Mauna Loa record remains the single most valuable CO_2 time series for carbon cycle model verification. For very recent interpretations of atmospheric CO_2 measurements and carbon cycle relationships. In this chapter, the global atmospheric CO_2 records, particularly of the NOAA/GMCC (National Oceanic and Atmospheric Administration/Geophysical Monitoring for Climatic Change) program, are summarized for the period 1968 through 1983, with emphasis on the mean properties of the global carbon cycle as viewed from the atmosphere (i.e., global mean CO_2 concentration, latitude dependence of concentration and seasonal amplitude, airborne fraction, etc.).

16743 **Simulating the atmospheric carbon dioxide distribution with a three-dimensional tracer model.** Heimann, M.; Keeling, C.D.; Fung, I.Y. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The usefulness of the simulation of atmospheric CO_2 with a three-dimensional tracer model has been demonstrated by Fung et al. The present study complements these findings with the inclusion of the effects of the time-invariant fossil fuel and stationary ocean CO_2 sources. Since atmospheric transport processes change with the season, it is necessary to consider the full set of CO_2 sources and sinks, to compare model results to the available data. In particular, the authors have shown that the time-invariant sources contribute to the seasonal signal. Similarly, the seasonal CO_2 sources give rise to mean annual fields that have to be taken into account when comparing model and data. The present assessment of the seasonal cycle depends crucially on the shape and timing of the assumed vegetation function in the specification of the seasonal land biospheric CO_2 source. A significant improvement requires a more realistic vegetation function. With the help of remote sensing data from satellites, a better representation of that function may be obtained in the future. The GISS model simulation of the mean annual fields predicts a too small interhemispheric exchange. As a next possible step, they will consider the use of observed global wind fields to drive the tracer model, instead of the wind fields generated by the GISS climate model. They also note that a more detailed representation of the oceanic source/sink terms is needed to obtain a realistic mean annual CO_2 concentration field. This requires either a model of the surface layer of the ocean, which includes the effects of the marine biosphere, or a fairly complete set of observations of pCO_2 as a function of space and time in the surface waters of the oceans.

16744 **Presentation of the 20th century atmospheric CO_2 record in Smithsonian spectrographic plates.** Stokes, G.M.; Barnard, J.C. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The history of 20th century scientific measurement programs does not contain many examples of long-running studies in which an important property of the atmosphere is reliably measured by the same person at the same site with precisions of >1%. A program that ran for a long period of time in the early and mid-20th century is the Smithsonian Solar Constant Program. Over the past several years, the authors have been studying whether a portion of the Smithsonian data set can be used to extend the record of atmospheric CO_2 concentrations back to the early 20th century. During the course of the Smithsonian Solar Constant Program, a wide variety of measurements were made; the ones of immediate interest are the spectrobolographic measurements. These observations consisted of several measurements of the transparency of the earth's atmosphere at wavelengths between 300 and 2500 nm. Within this wavelength interval are a number of absorption bands of CO_2 and, of course, the strength of these bands is a direct measure of the integrated column of CO_2 between the observer and the sun. In this chapter they will recount the efforts to use the observed strength of these bands to extract the abundance of CO_2 in the atmosphere over the course of the Smithsonian Solar Constant Program. They will discuss the following topics: The relationship between the density of an integrated column of CO_2 and surface measurements; The sources of error in a measurement of the integrated column; The details of their analysis of the Smithsonian spectrobolograms, as well as the precision of the results.

16745 **Atmospheric CO_2 record from direct chemical measurements during the 19th century.** Fraser, P.J.; Elliott, W.P.; Waterman, L.S. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

At a recent World Meteorological Organization meeting, scientists considered preindustrial measurements of atmospheric CO_2 made by direct methods such as chemical absorption, solar spectroscopy, and analysis of old air trapped in ice, as well as indirect methods involving ocean chemistry and isotopic tree-ring records. Those in attendance concluded that chemical methods indicate a range of preindustrial CO_2 concentrations from 250 to 290 ppmv, or 260 to 280 ppmv. It was suggested that the late 19th century measurements should be reassessed in the light of what is now known about the spatial and temporal variability of global atmospheric CO_2 measurements. The authors support the conclusions made at the WMO meeting. Using selection criteria designed to accept data collected during periods of maximum atmospheric mixing, a background CO_2 concentration for the northern hemisphere of 286 (+/-7) ppmv was found, based on six independent observers, or 280 (+/-12) ppmv, based on 13 different sampling locations. However, it could be argued that these concentrations represent upper limits since, in general, the data still show more variable and possibly elevated concentrations in winter, based on comparison with the modern background annual cycle.

16746 **Review of the history of atmospheric CO_2 recorded in ice cores.** Oeschger, H.; Stauffer, B. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Since the pioneering attempts by Scholander et al. (1961), the observation that the porous spaces in natural ice contain samples of ancient air, the study of ice cores for potential insights into the history of the atmospheric CO_2 concentration has received great attention from scientists interested i the reconstruction of environmental parameters. Progress, however, was made possible only because deep ice cores from Greenland and Antarctica, which are continuous sequences of generally high-quality samples formed during the last 100,000 and 50,000 years, respectively, were available for study. Research has led to new techniques for extracting gases from ice and to recent developments of sensitive and accurate techniques for the analysis of gas. Today, analysis of gas concentrations in air entrapped in natural ice is considered to be the most promising method for reconstructing the history of the atmospheric CO_2 concentration. In this chapter, the authors describe the state of the art of this research.

16747 **Ancient carbon cycle changes derived from tree-ring ^{13}C and ^{14}C.** Stuiver, M. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The history of the $^{13}C/^{12}C$ isotope ratio of atmospheric carbon is partly related to changes in the size of, and exchange rate between, the various terrestrial carbon reservoirs. The $^{14}C/^{13}C$ history is tied to these aspects as well. However, other major components of the ^{14}C history are the geomagnetic and solar changes that affect the flux of cosmic ray particles arriving at the earth's atmosphere. The discussions of atmospheric $^{14}C/^{13}C$ presented later include (1) long-term (10^3 to 10^4 years) change, (2) shorter-term (10 to 10^3 years) variability, an (3) the impact of fossil fuel CO_2 (which lacks ^{14}C) on atmospheric $^{13}C/^{12}C$ ratios. The $^{13}C/^{12}C$ analysis fo-

cuses on the complexities of this signal in tree rings an on a discussion of the magnitude of biospheric CO_2 release to the atmosphere.

16748 **Interpretation of the Northern Hemispheric record of $^{13}C/^{12}C$ trends of atmospheric CO_2 in tree rings.** Freyer, H.D. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The present long-term increase of atmospheric CO_2 has been accompanied by changes in the isotopic composition of its carbon atoms. Both the ratios of stable $^{13}CO_2/^{12}CO_2$ and radioactive $^{14}CO_2/^{12}CO_2$ have decreased as a result of anthropogenic activity. The decrease of the latter, until the beginning of nuclear testing caused an increase in the mid-1950s, is almost exclusively due to dilution of atmospheric CO_2 resulting from fossil fuel burning, from which the ^{14}C isotope had already decayed. The decrease of the $^{13}C/^{12}C$ ratio is a better measure of total anthropogenic activity because if reflects not only fossil fuel burning but also CO_2 released as a result of deforestation and agricultural manipulation of the soil. The CO_2 from both of these sources is marked by a $\sigma^{13}C$ deficit of about 18 to 20 per thousand$_0$. The present $^{13}C/^{12}C$ ratio of atmospheric CO_2 is about -7.5per thousand $_0$. Measurements show that the ratio has decreased from -6.69per thousand$_0$ in 1956 to -7.34per thousand$_0$ in 1978 and to -7.46per thousand in 1980. The preindustrial ratio is not yet available; however, since carbon in wood is assimilated from atmospheric CO_2, a historical record of the ratio could be stored in tree rings. Existing measurements leave no doubt that the $^{13}C/^{12}C$ ratio in the cellulose fraction of fraction of modern wood has indeed decreased significantly. However, an uncertainty exists in the interpretation of decreasing $^{13}C/^{12}C$ tree-ring data, mainly because the atmospheric $^{13}C/^{12}C$ information is often masked by scatter which is thought to depended on local environmental and climatological factors. This chapter summarizes some of these effects and, in addition, compares all published tree-ring data for the Northern Hemisphere.

16749 **Carbon isotope measurements in baseline air, forest canopy air, and plants.** Francey, R.J. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

This chapter reviews recent experimental results from a variety of Australian programs, each having potential relevance to the direct or proxy measurement of atmospheric $^{13}C/^{12}C$ variation, in particular the global variation resulting from the combustion of isotopically light carbonaceous material in fossil fuel.

16750 **Estimating changes in the carbon content of terrestrial ecosystems.** Houghton, R.A. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Estimates of change in the carbon content of terrestrial systems based on changes in the use of land worldwide since 1860 show a continuous net release of carbon to the atmosphere. The history of agricultural expansion is known well enough to preclude the possibility of a continuously decreasing biotic flux since 1920, although the possibility of a decreasing flux in the decades preceding 1980 cannot be ruled out. Those factors responsible for the greatest uncertainties in the time course of the net biotic release are the conversion of forests to uses other than permanent agriculture and carbon stocks, not of natural ecosystems necessarily, but of those ecosystems actually degraded or transformed to other uses. There is perhaps no better way to document changes in terrestrial ecosystems in the recent past and future than by observing them directly with remote sensing. Finally, changes can occur in the carbon content of terrestrial ecosystems not directly modified by man. Such changes could either augment or cancel the changes associated with land use. The response of natural systems to changes in climate or CO_2 are difficult to measure and difficult to predict.

16751 **One-dimensional and two-dimensional ocean models for predicting the distribution of CO_2 between the ocean and the atmosphere.** Bjoerkstroem, A. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

To assert anything about what the concentration of CO_2 in the atmosphere will be in the future requires that one understand the oceanic-atmospheric distribution of carbon and the way it may change when excess CO_2 is introduced into the atmosphere. The span of time during which the emission occurs is short compared to the slow oceanic circulation; therefore, it becomes natural to separate the mixing process into two parts: (1) the transport from the atmosphere into a thin surface layer of the ocean and (2) the exchange of water between the surface layer and deeper down. This chapter is review of the approaches that have been pursued in constructing mathematical models of the circulation of carbon between the atmosphere and the ocean.

16752 **Three-dimensional ocean models for predicting the distribution of CO_2 between the ocean and atmosphere.** Sarmiento, J. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The author would like to emphasize three points. The first concerns the feasibility and desirability of three-dimensional ocean models for simulating CO_2 distribution. Fairly realistic three-dimensional models are already in existence and in the process of being improved. However, these models are not likely to be useful as predictors of the absolute amount of CO_2 uptake for many years. Their best use for the present is as laboratories for improving understanding of physical processes and the role of chemical and biological processes in the carbon cycle, and for testing the simpler models currently being used to make CO_2 predictions. The second point is the extent to which a three-dimensional model is likely to behave differently than simpler models. The third important point is the extent to which three-dimensional models could make better use of the available tracer data. Unfortunately, the only place where there is adequate tracer and nutrient data is in the North Atlantic because of the TTO work. In other regions, particularly around the critical deep and intermediate water formation areas of the Antarctic, information is very sparse. It is for this reason that the initial effects were concentrated in the Atlantic. Thus far, heavy use of hydrographic and tracer data in model studies has been made. Heavy use of the TTO nutrient and carbon system data in developing the model of chemical and biological processes is also being made. Data of this quality will eventually be needed from all the ocean basins if they are to expand their efforts to the world oceans.

16753 **Geologic analogs: their value and limitations in carbon dioxide research.** Sundquist, E.T. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

This chapter is a beginning attempt to constrain and quantify the relevance of geologic analogs to research on the effects of anthropogenic CO_2. The geologic record is inherently reflective of time scales longer than those usually considered in CO_2 research. However, calculated effects of natural perturbations suggest the working hypothesis that, if atmospheric CO_2 has varied by twofold or greater in the geologic past, these variations were most likely caused by processes acting over time scales of 100,000 years or longer. This hypothesis implies that the long-term resolution of the geologic record is not in itself a limitation in the study of geologic analogs of CO_2 changes comparable to those anticipated from burning fossil fuels. Geologic analogs offer not only the possibility of documenting past changes in atmospheric CO_2 but also of understanding the processes that caused them. An understanding of these long-term processes is also essential to anticipating the long-term effects of anthropogenic CO_2. The model experiment presented here

suggests that the geochemical perturbations resulting from anthropogenic CO_2 may persist for tens of thousands of years. Although such long-term projections are subject to many large uncertainties, the overriding conclusion is that significant long-term geochemical effects are possible. The chemical equilibrium relationships in the model are well established, and uncertainties in ocean mixing have diminishing importance over long time scales. Implicit in these long-term concerns is the need to look beyond the climatic effects of CO_2 during the next few decades. Although potential climatic effects have justifiably caused great concern and research interest, they must be viewed as part of a continuum of effects that may be manifested over a variety of time scales.

16754 **Requirements for a satisfactory model of the global carbon cycle and current status of modeling efforts.** Bolin, B. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Work during the last two decades has given us a general understanding of the global carbon cycle, and we are also able to estimate its approximate response to anthropogenic emissions of CO_2 into the atmosphere. Present models, however, are inadequate for more precise projections into the future. Even though the role of the oceans is better understood than that of the terrestrial biota, considerable improvements in the modeling of all parts of the carbon cycle are essential. It is not until the response characteristics are well described on all time scales for a few years to one or two centuries that we will be possible to analyze more subtle processes, which may be quite important when projecting until the time when atmospheric CO_2 concentrations will have doubled. Detailed models are needed for comparison of what is implied by a synthesis of the present knowledge in terms of a model and the real behavior of the carbon cycle as revealed by observations.

16755 **Use of observations in calibrating and validating carbon cycle models.** Enting, E.G.; Pearman, G.I. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The authors describe the general characteristics that are desirable in the data used for calibrating carbon cycle models. The next two sections describe how these characteristics relate to the techniques of constrained inversion that the authors used in their calibrations and the extension of this approach into the sensitivity analysis. They then include a section presenting results from a one-dimensional model and discusses the relative importance of the various model parameters and the various items of data used in the calibration. The following section extends this analysis to consider some of the types of data that they have not used either because of doubts about their applicability or because the observational programs are still in progress. By performing model calibrations using various possible data values, they can assess the extent to which such data could reduce the uncertainties in their knowledge of the global carbon cycle. Finally, they discuss some of the issues involved in the choice of data for modeling the carbon cycle with two- or three-dimensional models.

16756 **Analysis of the seasonal and geographical patterns of atmospheric CO_2 distributions with a three-dimensional tracer model.** Fung, I.Y. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Initial attempts to model atmospheric CO_2 distribution (with the ocean and biosphere as seasonal sources and sinks) encourage the notion that this approach will lead to useful quantitative constraints on CO_2 fluxes and changes in these fluxes. Realization of this objective will require: 1. Continued improvement in the realism of 3-D global transport modeling. 2. Information about the geographical distribution and seasonal variations of marine biota, total alkalinity, and total carbon concentrations in the surface waters. 3. Realistic models of the seasonal behavior of terrestrial biota that are based on knowledge of the behavior of the biota rather than derived by simple transport models. 4. Extended timelines of atmospheric CO_2 monitoring, with improved precision and definition of the uncertainties in the measured CO_2 amounts. Many of the potential applications depend on measurement of perturbations of the CO_2 distributions and changes in time or in geographical distribution. Consequently, accurate calibration and intercalibration among different observing stations is important.

16757 **Fossil fuel combustion: recent amounts, patterns, and trends in CO_2.** Rotty, R.M.; Marland, G. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Several types of human activity introduced perturbations that impinge on the natural global carbon cycle. During the past century of so, one of the major perturbations has been the release of carbon from long-term storage through the combustion of fossil fuels. During the next 100 years fossil fuel use will almost certainly be the major source causing increased levels of CO_2 in the atmosphere. Fossil fuel combustion now releases CO_2 at the rate of 5 gigatons of carbon per year. The annual emissions from fossil fuel combustion during the period following World War II grew exponentially at a near constant value of 4.5% per year until 1973. Since then the global growth rate has been <2% per year. The annual rate of emission of CO_2 from fossil fuel combustion is generally conceded to be one of the better known facts about the CO_2 problem. Only the increase in the amount of CO_2 in the atmosphere during the past 25 years can be documented with greater confidence. Because the fossil fuel recoverable resources are so vast, it is very difficult to foresee any world scenario that denies continuing use of very large amounts of fossil fuels. As a consequence, the annual emissions are likely to continue to grow and become even more central to any developing CO_2 problem.

16758 **Possible changes in future use of fossil fuels to limit environmental effects.** Perry, A.M. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The role of the other greenhouse gases in altering future climate, and especially their future concentrations in the atmosphere, are at this stage subject to very large uncertainties. The conclusions that a greenhouse warming of a few degrees Celsius is inevitable and that cutting back on CO_2 emissions from fossil fuels would not help much, therefore, seem to be somewhat premature. However, the analysis does point up dramatically the need to get a much better understanding of the potential effect of the other greenhouse gases as well as that of CO_2. It may well be that restrictions on fossil fuel use would not be very effective in limiting future climate change unless simultaneous measures were taken to restrict emissions of other anthropogenic greenhouse gases.

16759 **Effects of dynamic heat fluxes on model climate sensitivity: meridional sensible and latent heat fluxes.** Gutowski, W.J. Jr.; Wang, W.C. (Atmospheric and Environmental Research Inc., Cambridge, MA). *Journal of Geophysical Research;* **90**: No. D7, 13,081-13,086(20 Dec 1985). Contract AC02-81ER60023.

The authors incorporate physically based parameterizations of atmospheric meridional heat fluxes into the climate model of Wang et al. (1984) to study their effects on climate changes caused by increases of CO_2 abundance and solar constant variations. The physically based parameterizations calculate both the magnitudes and profiles of the sensible and latent heat fluxes in good agreement with observations. Comparisons of climate sensitivity between the physically based parameterizations and the original model's empirical parameterization for total transport are performed. The results indicate that both parameterizations yield about the same changes in global mean surface temperature and ice line, but the physically based parameterizations produce smaller changes in meridional temperature gradient. Also, the sensible and latent heat fluxes from the

physical parameterization produce mutually compensating changes which are consistent with general circulation model results. They also study the separate feedback effects of sensible and latent heat fluxes by allowing only one or the other to change during climate changes. It is found that these variations in the partitioning of changes in the meridional heat transport have relatively small effects on the change of hemispheric mean surface temperature, but they can affect both the sign as well as the magnitude of the change of meridional temperature gradient. The change in total meridional heat transport is also relatively insensitive to the partitioning variations. Further analysis of the mode's energy balance indicates that this insensitivity is a consequence of two features of the results: (1) absorption of the latitudinally varying part of the solar heating is affected very little by the partitioning, and (2) thermal structure changes that are affected by the partitioning do not influence greatly the zonal energy balance.

16760 **Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$.** Wang, W.C.; Molnar, G. (Atmospheric and Environmental Research, Inc., Cambridge, MA). *Journal of Geophysical Research;* 90: No. D7, 12,971-12,980(20 Dec 1985). Contract AC02-81ER60023.

The authors use the two-dimensional (altitude-latitude) radiative-dynamical model of Wang et al. (1984) to investigate the effects on vertical and meridional temperatures of increases of atmospheric methane, nitrous oxide, and chlorofluorocarbons. The model couples are the meridional and vertical temperature structure through energy balance between radiative flux and vertical and meridional heat transports. They show that the thermal radiation flux perturbations, i.e., the driving force for the subsequent climate change, caused by increases of these trace gases and carbon dioxide, are different in nature. The two-dimensional model simulates much more realistic temperature and humidity distributions than does a one-dimensional model. For a doubling of the atmospheric CO_2 concentration of 330 parts per million by volume, the two-dimensional model computes a global surface warming of 3.7 K with larger high-latitude amplification, which is in good agreement with results obtained from general circulation models. For the study of the surface warming due to increases of trace gases, it is found that the one-dimensional model using a 6.5 K km^{-1} critical lapse rate for convective adjustment appears to calculate a much larger surface warming than the two-dimensional model. On the other hand, the one-dimensional model using the moist adiabatic critical lapse rate, although it can not simulate adequately the present tropospheric temperature structure, calculates surface warming effects in close agreement with those of two-dimensional model results. Although the calculations depend largely on the adopted scenarios for future increases, the results from the two-dimensional model nevertheless reveal that, on the time scale of decades, the trace gases could potentially augment the surface warming due to carbon dioxide increase by more than 60%.

16761 **Analytical solution for the effect of increasing CO_2 on global mean temperature.** Wigley, T.M.L.; Schlesinger, M.E. (Univ. of East Anglia, Norwich, England). *Nature (London);* 315: No. 6021, 649-652(20 Jun 1985). Contract AC02-79EV10098.

Oceanic thermal inertia effects can significantly slow the response of the climate system to external forcing. The main controlling parameters are the effective diffusivity of the ocean below the upper mixed layer (k) and the climate sensitivity (defined by ΔT/ sub 2x/). Here they present a more general analysis of two cases, forcing by a step function change in CO_2 concentration and by a steady CO_2 increase. The former case may be characterized by a response time which they show is strongly dependent on both k and ΔT/sub 2x/. In the latter case the damped response means that, at any given time, the climate system may be quite far removed from its equilibrium with the prevailing CO_2 level. The observed global warming over the past 100 years can be shown to be compatible with a wide range of CO_2-doubling temperature changes.

16762 **Global atmospheric CO_2 distribution and variations from 1968-1982 NOAA/GMCC CO_2 flask sample data.** Komhyr, W.D.; Gammon, R.H.; Harris, T.B.; Waterman, L.S.; Conway, T.J.; Taylor, W.R.; Thoning, K.W. (NOAA Air Resources Lab., Boulder, CO). *Journal of Geophysical Research;* 90: No. D3, 5567-5596(20 Jun 1985).

CO_2 data obtained from discrete sampling during 1968-1982 at 23 National Oceanic and Atmospheric Administration/Geophysical Monitoring for Climatic Change and foreign cooperative stations are presented, together with a description of the measurement program and data quality. Monthly, seasonal, and annual CO_2 concentrations are determined by the individual stations from select (background) data. Temporal and spatial global CO_2 distributions yield annual and seasonal latitudinal gradients, abundances, airborne fractions, annual cycle amplitudes and phases, annual cycle amplitude growth rates, and global growth rate variations of CO_2. The time-series data sets reveal variations related to several El Nino/ Southern Oscillation events, particularly with respect to the strength of the CO_2 source in the equatorial Pacific Ocean and global CO_2 growth rates. CO_2 growth rate anomalies correlate highly with the Southern Oscillation Index, which is related to the strength of the easterly trade winds that blow along the equator. 54 references, 17 figures, 12 tables.

16763 **Modeling needs for predicting responses to CO_2 enrichment: plants, communities and ecosystems.** Dahlman, R.C. (Dept. of Energy, Washington, DC). *Ecological Modelling;* 29: 77-106(1985).

Carbon dioxide enhancement of plant growth is an important direct effect of rising atmospheric CO_2. New or modified modeling approaches are needed to understand and predict responses of native species and ecosystems to CO_2 enrichment. As atmospheric CO_2 doubles within the next 100 years, validated models will be important tools for predicting responses such as changed productivity, altered composition of plant communities, and changes in amounts of sequestered carbon. Needs for modeling plant and ecosystem responses are discussed as part of a comprehensive plan for research of direct effects of CO_2 on vegetation. Primary needs are: (a) a level of model complexity commensurate with general ecological knowledge, one which treats principal CO_2 response functions; (b) the development of models for predicting plant, community and ecosystem responses to CO_2, (c) an evaluation of sensitivity and uncertainty of CO_2-dependent model parameters; and (d) validation of model predictions. A secondary need is to establish a framework for evaluating data requirements for models. 48 references, 8 figures, 2 tables.

16764 **Predicting the response of plants to increasing carbon dioxide: a critique of plant growth models.** Reynolds, J.F.; Acock, B. (North Carolina State Univ., Raleigh). *Ecological Modelling;* 29: 107-129(1985). Contract AI01-81ER60001.

It is widely recognized that increasing global carbon dioxide concentration in the atmosphere may alter the growth of plants. This has lead to speculation about the long-term impact of rising CO_2 on agricultural productivity and on natural ecosystems, e.g., shifts in native species distributions and sequestering of carbon in forests. In this paper they critique some existing plant growth models with regard to their potential for predicting and evaluation possible scenarios of vegetation response to elevated CO_2 levels. To facilitate this, they present various criteria for model evaluation, specify a minimum set of plant processes that should be considered for inclusion in a generic model capable of predicting plant response to CO_2, survey numerous published plant growth models with respect to these criteria, and propose a scheme for identifying the various options available for modeling the response of vegetation to CO_2.

16765 **Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rica, Panama, Peru, and Bolivia.** Hall, C.A.S.; Detwiler, R.P.; Bogdonoff, P.; Underhill, S. (Cornell Univ., Ithaca, NY). *Environmental Management;* 9: No. 4, 313-334(1985).

This group, composed of modelers working in conjunction with tropical ecologists, has produced a simulation model that

quantifies the net carbon exchange between tropical vegetation and the atmosphere due to land use change. The model calculates this net exchange by combining estimates of land use change with several estimates of the carbon stored in tropical vegetation and general assumptions about the fate of cleared vegetation. In this report, the authors use estimates of land use and carbon of land use and carbon storage organized into six life zone (sensu Holdridge) categories to calculate the exchange between the atmosphere and the vegetation of four tropical countries. Their analyses of these countries indicate that this life zone approach has several advantages because (a) the carbon content of vegetation varies significantly among life zones, (b) much of the land use change occurs in life zones of only moderate carbon storage, and (c) the fate of cleared vegetation varies among life zones. Their analyses also emphasize the importance of distinguishing between temporary and permanent land use change, as the recovery of vegetation on abandoned areas decreases the net release of carbon due to clearing. They include sensitivity analysis of those factors that they found to be important but are difficult to quantify at present.

16766 **Atmospheric CO/sub 2/ variations based on the tree-ring 13/sub C/ record.** Peng, T.H. (Environmental Sciences Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 123-131 of The carbon cycle and atmospheric CO/sub 2/: Natural variations Archean to present. Sundquist, E.T.; Broecker, W.S. Washington, DC; American Geophysical Union (1985). (CONF-840181—).

From American Geophysical Union Monography meeting on carbon dioxide through geologic time; Tarpon Spring, FL, USA (15 Jan 1984).

The reconstruction of atmospheric CO/sub 2/ concentrations over the last 150 years, based on a deconvolution of the tree-ring-based /sup 13/C record, is reviewed. Assuming that Freyer's latest composite /sup 13/C record for the northern hemisphere represents global changes in the /sup 13/C//sup 12/C ratio of atmospheric CO/sub 2/ induced by changes in atmospheric CO/sub 2/ concentration due to deforestation, soil manipulation, and combustion of fossil fuels, the deconvolution, using the modified box-diffusion model, gives the following results: (1) the magnitude of the integrated CO/sub 2/ release from the terrestrial biosphere since 1800 is about 90% of that from fossil fuel; (2) over the two-decade period covered by the Mauna Loa atmospheric CO/sub 2/ record, the input from the forest-soil source is about 15% of that from fossil fuels; (3) the /sup 13/C//sup 12/C trend and the atmospheric CO/sub 2/ anomaly over the last two decades have been dominated by the input of fossil fuel CO/sub 2/; and (4) the pre-1850 atmospheric CO/sub 2/ content is estimated to be about 266 ppm. The integrated amount of CO/sub 2/ released from the terrestrial biosphere between A.D. 1800 and 1980 is estimated to be 12 x 10/sup 15/ mol which is to be compared with the previous estimate of 22 x 10/sup 15/ mol on the basis of Freyer and Belacy's (1983) /sup 13/C data. This indicates that tree-ring /sup 13/C-based estimates are volatile and further changes are likely.

16767 **Core processing and first analysis of ice cores from Siple and South Pole stations.** Stauffer, B.; Schwander, J. (Univ. of Bern, Switzerland). *Antarctic Journal of the United States;* **19**: No. 5, 59-61(1984).

Analysis of ice cores from the Antarctic allows the authors to study the history of climatic parameters such as temperature, annual accumulation, and atmospheric composition. The main goal of their laboratory analysis of these of these ice cores is to investigate the preindustrial atmospheric carbon dioxide concentration and its natural variations and to measure the carbon-13/carbon-12 ratio in the preindustrial carbon dioxide and in other atmospheric trace gases such as methane. The cores drilled during 1983-1984 field season at the South Pole will be analyzed during the coming year. Several analyses have been made, however, on such cores drilled in the previous field seasons: the analysis of the carbon dioxide concentration of air extracted from ice cores indicates that the preindustrial atmospheric carbon dioxide concentration was about 280 parts per million by volume as compared to present levels of about 340 parts per million. There is some evidence that this value is more accurate than the lower value reported earlier by a laboratory in Grenoble and by their laboratory. They also measured the carbon-13/carbon-12 ratios of carbon dioxide and of the methane concentration. These results are still preliminary and will be reported later.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15443, 15554, 16074, 16517

16768 **(GSF—16/86) Environmental radioactivity and radiation exposure in southern Bavaria after the Chernobyl accident.** (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz). 15 Jun 1986. 40p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750509.

Since April 30, 1986, comprehensive nuclide-specific measurements have been carried out in air, precipitations, soil, grass, and food in order to determine the fission product activity as a result of the Chernobyl accident. The increase in the gamma dose rate induced by the fission product fallout has been measured primarily in Bavaria. Some important results of the measurements so far are listed in the report. Based on these data, a preliminary assessment is made of the longterm radiation dose to the population in the region of southern Bavaria. The assessment takes into account the dose commitment emanating from external beta and gamma radiation, from intake with food, and by inhalation of fission products.

16769 **Field evaluation of an emergency response atmospheric dispersion model.** Weber, A.H.; Kurzeja, R.J.; Addis, R.P.; Milham, R.C. (Savannah River Lab., Aiken, SC). *Transactions of the American Nuclear Society;* **53**: 70-71(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

An important consideration in planning emergency response operations is the validity of the atmospheric dispersion models used to characterize and predict the path of a radionuclide or chemically hazardous atmospheric release. For the past several years, the Savannah River Laboratory (SRL) has performed field experiments to evaluate the emergency response code PUFF-PLUME, which is used at the Savannah River Plant (SRP) site. Results from an extensive series of daytime experiments are presented, along with preliminary results from a pair of recent nighttime experiments.

5005 Site Resource And Use Studies

16770 **(ANL/EES-TM—318-Vol.2) Estimated monthly emissions of sulfur dioxide and oxides of nitrogen for the 48 contiguous states, 1975-1984: Volume 2, Supporting data bases and monthly SO_2 and NO/sub x/ estimates by state.** Knudson, D.A. (Argonne National Lab., IL (USA)). Dec 1986. Contract W-31109-ENG-38. 409p. NTIS, PC A18/MF A01; 1; GPO Dep. File Number DE87005208.

Statistics are reported for non-utility sources for each state. (PSB)

5006 Regulations

REFER ALSO TO CITATION(S) 16727

16771 **(PB—87-113882/XAB) Vinyl chloride standards: responses to comments on January 1985 proposed revisions.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Sep 1986. 84p. (EPA—450/3-86/004). NTIS, PC A05/MF A01.

The document summarizes and responds to comments on the proposed revisions to the vinyl chloride standard set under Section 112 of the Clean Air Act.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 15487, 16736, 16886

16772 **Design and use of climatological data banks, with emphasis on the preparation and homogenization of surface monthly records.** Palutikof, J.P.; Goodess, C.M. (Univ. of East Anglia, Norwich, England). *Climatic Change;* 9: 129-147(1986). Contract AC02-79EV10098;AC02-81EV10739.

The procedures involved in constructing data banks for use in climatological research are described. Such data banks will normally have two component parts: the meteorological records themselves, and the accompanying documentary and information systems. As a first step, meteorological records appropriate for the intended application of the data bank must be collected and stored, commonly in a computer. Individual records must then be merged into a form convenient for the user. Procedures for quality control of the data are discussed. The authors emphasize the need to ensure that records are homogeneous, i.e., that they do not contain spurious jumps or trends caused by non-climatic factor such as site change or urbanization. Some techniques to correct inhomogeneities in meteorological records are described. The documentation accompanying the meteorological records has three components: first, information on the individual records, second, a list of data sources, third, station histories. The station histories will be added to as work progresses on the data bank, to describe any attempts to homogenize records, and ultimately to give the compiler's assessment of the reliability of each record. User needs must be considered at all stages of data bank design and construction.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 16221, 16222, 16710, 16750, 16892, 16900, 16904

16773 **(CONF-8608141—1) Radiodensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth.** Kienast, F. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002412.

From Industrial symposium on ecological aspects of tree ring analysis; Terrytown, NY, USA (17 Aug 1986).

Relationships among weather conditions, site elevations, site characteristics, and ring formation on trees growing along altitudinal transects were investigated. Thirty-four chronologies from four different climatic regions with a wide range of site conditions were analyzed with radiodensitometric methods. A graphical technique of data representation was developed to analyze the tree-ring pattern on a single-year basis. Typical examples are presented and the dynamics of the overlapping environmental influences are discussed. The broad spectrum of site conditions was used to identify ring parameters and site types most suitable for reconstruction of temperature or precipitation records. Additionally, the transects served as an ideal data base to test the theory of a possible growth enhancement caused by increased atmospheric carbon dioxide. Results show a growth increase (mainly in the ring widths) in about 25% of all chronologies during the last three decades. In most of the cases the increase is related to a specific site type, influenced only slightly by climatic stress. Sensitive chronologies with heavy climatic stress and complacent series did not show the increase. However, more favorable climatic conditions were found to coincide with this increase in more than 60% of all the chronologies that showed increased growth. Extrinsic factors such as higher CO_2 levels, could have contributed to an increase in only 10 to 15%, at the most, of the 34 chronologies.

16774 **(NP—7750865) Studies on heavy metals in household refuse and on heavy metals concentration in certain fractions or groups of materials by suitable treatment.** Bidlingmaier, W.; Kranert, M.; Schweizer, W. (Arbeitskreis fuer die Nutzbarmachung von Siedlungsabfaellen e.V. (ANS), Wiesbaden (Germany, F.R.)). May 1984. 91p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750865.

The following tasks were to be carried out: Determination of the total heavy metal concentration in domestic refuse; development of an adequate sampling system; measurement of heavy metal concentrations in different groups of materials in order to determine their origins and determination of heavy metal concentrations in different screen fractions. The second step was an investigation into the possible ways of applying the findings for the purpose of minimizing heavy metal concentrations in a waste disposal system. The possibility of concentrating heavy metals in certain groups of materials or screen fractions is investigated.

16775 **(NP—7751302) Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils.** Dietze, G. (Goettingen Univ. (Germany, F.R.). Forschungszentrum Waldoekosysteme - Waldsterben). 1985. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE87751302.

For closer characterization of the specific forms of aluminium occurring in the gravitational water of acidified forest soils, especially those bound to organic constituents, a concept of methods was worked out permitting to differentiate between the forms of aluminium as regards their ecologic importance. A spruce stand in the Solling forest was selected as a site where the concept was to be applied. Humus funnel solutions obtained in situ and water extracts, prepared at the laboratory, of the soil layer covering the humus were investigated and compared. A joint consideration of all the results permits the conclusion that aluminium, under the site conditions given, is present predominantly in organic compound form. This form can by all means be considered stable in terms of thermodynamics; yet, with kinetic regards, it proves to be an extremely labile to moderately labile form. In this connection the medium-to high-molecular organic constituents of gravitational water are of special significance.

16776 **(PB—87-112413/XAB) Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems.** McLean, J.E.; Dudley, L.M.; Sims, R.C. (Utah State Univ., Logan (USA). Utah Water Research Lab.). Sep 1986. 77p. NTIS, PC A05/MF A01.

Immobilization processes in soil/waste systems impacted by hazardous wastes containing heavy metals were investigated. Samples of contaminated material (soil and/or waste) from nine sites in the Intermountain West and California included milling, electroplating, cement kiln dust, petroleum, and tailing and waste rock from mining operations. A sequential extraction procedure, originally developed to fractionate metals in sludge-amended soils into water soluble, mobile, and plant-available forms, was used to obtain preliminary identification of the leachable-metal fraction for the hazardous-waste-contaminated soils studied. Sorption kinetics and batch sorption/desorption studies were performed to determine the interaction of Cu and Cd, from an acidic leachate of a mine waste, with calcareous soils. Solid phase diagrams, exchange models, and GEOCHEM were used to define the mechanisms of metal attenuation of these soils.

16777 **(PNL—5750-Pt.5, pp 41) Effluent monitoring systems at Department of energy facilities.** Unruh, C.M. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

The purpose of this task is to: (1) evaluate the system design, procedures, and performance of Department of Energy effluent monitoring for both routine and accidental releases; (2) identify significant deficiencies or problem areas; (3) provide technical assistance as requested; (4) verify performance of selected systems by direct independent measurements (to be accomplished by a subcon-

tract to EG & G-Idaho); and (5) provide a mechanism to facilitate exchange of information between facilities.

16778 **Changes in soil carbon storage and associated properties with disturbance and recovery.** Schlesinger, W.H. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The main finding of this chapter is that the loss of carbon from soil profiles on cultivation is about 30% over a 20- to 50-year interval. This value is lower than parameters used in most recent models of anthropogenic changes in the global carbon cycle. Lower values result when field data are expressed in terms of the change in soil carbon storage, rather than the change in the percent organic carbon in soil samples, because losses of carbon are associated with increases in soil bulk density. Losses in the surface layers are often > 30%, but a large amount of soil carbon occurs in the lower portion of the profile and shows little change. More field work is needed in areas of organic soils and in tropical savanna and arid ecosystems. The pattern of loss of soil carbon on land-use conversion suggests that the soil organic matter can be divided into two fractions: labile and refractory. Changes in ^{14}C age and the C:N ratio with cultivation are consistent with the loss of the more labile fractions comprised of recent plant residues. The major loss of soil carbon occurs in the first 20 years after land-use conversion, and is associated with an increased release of CO_2 from soils to the atmosphere. This rapid decline in soil organic matter should be relatively easy to simulate in bookkeeping models of terrestrial carbon storage.

16779 **Continental and global scale remote sensing of land cover.** Tucker, C.J; Townshend, J.R.G.; Goff, T.E.; Holben, B.N. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Satellite remote sensing of land cover at regional, continental, and global scales is possible using NOAA-satellite AVHRR data. The daily acquisition of imagery for the entire planetary surface provides the means to overcome cloud cover, atmospheric effects, and other degrading influences while recording the aggregated response of green leaf biomass at scales of 1 km and larger. One-kilometer data have been used to identify areas of tropical deforestation, while remapped and sampled 4-km data have been used to classify the land cover of Africa and document the seasonal dynamics of global green leaf biomass. These data provide the means for monitoring the terrestrial biota and advancing understanding of the role of the terrestrial biota in the carbon cycle.

16780 **Changes in the area of forests in Rondonia, Amazon Basin, measured by satellite imagery.** Woodwell, G.M.; Houghton, R.A.; Stone, T.A.; Park, A.B. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

Rates and areas of deforestation can be determined from both LANDSAT and NOAA7 satellite data. Information from the analysis of satellite data can be used to lessen current uncertainty about rates of deforestation in tropical forests. LANDSAT data tapes from three different years were used to determine the amount of forest cleared in one LANDSAT scene in the Brazilian Amazon Basin state of Rondonia. Rates of deforestation in the area of the LANDSAT scene (34,000 km_2) doubled over the 1976 to 1981 period examined. Rates of deforestation can be determined using a 5-year interval; this interval is too long to determine accurately other types of transformations such as nonforest to agriculture or pasture. No nonforest-to-forest transformation was found in Rondonia, presumably because all areas cleared are kept either in pasture or crops and are not allowed to return to forest. With data from LANDSAT an NOAA7 the authors have determined that at least 11,400 km^2 of Rondonia has been deforested up to 1982. This estimate tends to confirm the higher estimates from other sources. The amount of carbon lost to the atmosphere due to forest clearing within the area of the Rondonia LANDSAT scene was determined using a regional version of the MBL/TCM, with clearing rates determined from the LANDSAT change-detection analysis. Between 3.9×10^{12} and 5.5×10^{12} g C were released in 1981.

16781 **The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems.** Johnson, D.W.; Richter, D.D. (Sciences Div., Oak Ridge National Lab., P.O. Box X, Oak Ridge, TN 37831). pp 149-156 of Proceedings of the 1984 research and development conference. Atlanta, GA; Tappi Press (1984). (CONF-8409153—). Contract AC05-84OR21400.

From TAPPI research and development conference; Appleton, WI, USA (30 Sep 1984).

Atmospheric deposition can cause nutrient gains (N, S) or losses (Ca, Mg, K) from forest ecosystems whereas harvesting causes only losses. Available data indicate that S deposition in polluted regions greatly exceeds S export via whole-tree harvesting, but this is not normally the case for N. Both atmospheric acid deposition (in concert with internal acid production) and harvesting can cause the loss of base cations, but because of tree selectivity in cation uptake, it appears that harvesting will have a greater impact on the export of scarce or limiting cations than will acid deposition or internal acid generation. However, nutrient losses via harvesting can be minimized by timing harvests and losses can be compensated for by proper fertilization under intensive management regimes.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15442, 15444, 15474, 15475, 15476, 16387, 16768

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 16710, 16750, 16765, 16774, 16778, 16779, 16780

16782 **(ORNL/ESH—1/V24) Resource management plan for the Oak Ridge Reservation: Volume 24, Threatened and endangered animal species.** Kroodsma, R.L. (Oak Ridge National Lab., TN (USA)). Jan 1987. Contract AC05-84OR21400. 24p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005283.

United States and Tennessee laws provide protection for wildlife species that the US Fish and Wildlife Service (FWS) and the Tennessee Wildlife Resources Agency (TWRA) have determined to be endangered or threatened. These laws and their implications for management of the Oak Ridge Reservation (ORR) are briefly discussed. The historical occurrence, current status, and recommended surveys and management plans for all threatened and endangered (T and E) wildlife species with a reasonable probability of occurring on the ORR are also discussed. Seventeen species of T and E mollusks historically occurred in the Oak Ridge area, but no management action is recommended because reservoir construction and other factors not related to Department of Energy operations have eliminated suitable habitat. Systematic surveys and management actions are also not recommended for three species of T and E fish, one amphibian species, one reptile species, six bird species, and two mammal species because of the very low potential for the occurrence of these species on the ORR. For three T and E bird species on the ORR, no feasible or significantly beneficial management actions could be identified. Surveys and consideration of possible management actions are recommended for three state-listed bird species that occur on or near the ORR and for two federally listed bat species that occur in East Tennessee and may occur on the ORR.

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 15488, 15613, 16709, 16786, 16789, 16933

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 15440, 16741, 16743, 16751, 16752, 16756, 16776, 16777, 16792, 16892

16783 **(PB—87-112439/XAB) Design of a drinking-water-quality monitoring program.** Godfrey, P.J.; Ruby, A.; Zajicek, O.T.; DeFrancesco, S.J.; Sutherland, M. (Massachusetts Univ., Amherst (USA). Water Resources Research Center). Aug 1986. 123p. (PUB—154). NTIS, PC A06/MF A01.

The report reviews literature on the impacts of acid deposition and the effect of acidic water on drinking-water quality: it reveals that the majority of surface water supplies in Massachusetts are vulnerable to acidification, that surface-water supplies have experienced historical losses of acid-neutralizing capacity, and that the primary potential cause of acidification-related water-quality degradation of household drinking water is the corrosion of water supply distribution pipes.

16784 **Calibrating ocean models by the constrained inverse method.** Moore, B. III; Bjoerkstroem, A. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

To understand more thoroughly the global carbon cycle as a whole and the oceanic sink in particular, it is increasingly evident that the heterogeneity of the various components must be considered. Oceanic models whose components represent actual oceanic regions are clearly necessary. This will require methodologies that are appropriate for systems with hundreds of boxes as well as techniques to extract consistent information from diverse global data sets. The existence of data and the use of data are fundamental to future progress; higher-resolution oceanic models must be built upon extensive sets of consistent oceanographic data. There are no shortcuts possible with regard to the requirement of data. It would appear that the methodology of constrained inversion that the authors have presented is particularly well-suited to develop the spatially detailed global ocean models through logical exploitation of the important information contained in GEOSECS and Levitus (1982), the developing data set that TTO hopefully will provide, and region-specific oceanic data sets that exist around the world. Such geographically detailed ocean models should allow more accurate estimates of the ocean uptake of fossil fuel CO_2 over the last 100 years and, hence, indirectly an independent estimate of net exchange of CO_2 between the atmosphere and the biosphere. Obviously, such estimates are important benchmarks in their understanding of the carbon cycle generally and, hence, part of the foundation for any predictions about the future.

16785 **Measurements of total carbon dioxide and alkalinity in the North Atlantic Ocean in 1981.** Brewer, P.G.; Bradshaw, A.L.; Williams, R.T. pp vp of Changing carbon cycle: a global analysis. Trabalka, J.R.; Reichle, D.E. (eds.). New York, NY; Springer-Verlag (1986). (CONF-8310436—).

From 6. annual ORNL life science symposium; Knoxville, TN, USA (31 Oct 1983).

The ocean uptake of fossil fuel CO_2 has long been recognized as the principal modulator of the rising atmospheric CO_2 level. If the authors are to observe and understand this effect, then an essential step is the accurate measurement of the CO_2 properties of the ocean. Historically this has been quite difficult to achieve. Although measurements of some kind date back to the late 19th century, complete, documented, and verifiable measurements are scarce indeed. This chapter describes and documents the series of total CO_2 and alkalinity measurements of seawater made on the North Atlantic Ocean during the Transient Tracers in the Ocean (TTO) expedition in 1981, and presents briefly the signals these data reveal.

16786 **Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast.** Walsh, J.J.; Premuzic, E.T.; Gaffney, J.S.; Rowe, G.T.; Harbottle, G.; Stoenner, R.W.; Balsam, W.L.; Betzer, P.R.; Macko, S.A. (Univ. of South Florida, St. Petersburg). *Deep-Sea Research, Part A: Oceanographic Research Papers;* 32: No. 7, 853-883(1985). Contract AC02-76CH00016.

A comparison is made of organic content, sedimentation rates derived from ^{14}C and ^{210}Pb analyses, ^{13}C and ^{15}N isotope ratios, amorphous silica, particle size, and calcium carbonate within sediments from slopes off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast. These sediments are mainly marine, diatom-rich, and about one-third of the organic carbon is recent, reflecting a possible transient of shelf export in response to man's increased activities since the industrial revolution. Using a combination of sedimentation and mixing rates of carbon, the C:N ratio of sediments within the upper 50 cm, and the amount of nitrogen thought to be released from the coastal zone, independent estimates suggest a carbon loading to world slopes of ~ 0.3 to 0.5×10^9 tons C y^{-1}. The Bering slope exhibits no anthropogenic transients, however, while increased carbon loading may have occurred off Peru in response to overfishing and off the mid-Atlantic bight in response to eutrophication. The generality of their results depends on which of the three systems is most representative of world slopes.

16787 **Preliminary observations of oxygen and carbon dioxide of the wintertime Bering Sea marginal ice zone.** Chen, C.T.A. (Oregon State Univ., Corvallis). *Continental Shelf Research;* 4: No. 4, 465-483(1985). Contract AC05-84OR21400.

Wintertime oxygen and pH profiles across the marginal ice zone of the central and southeastern Bering Sea shelf are analyzed and compared with summer data. During the winter, at water depths shallower than 75 m, the water column is homogeneous and near freezing. Between the 75- and 200-m isobaths the structure is essentially two-layered, a cool and fresh upper layer overlying a warmer, more saline bottom layer. The oxygen concentration in the surface mixed layer is higher than the summer values, but the degree of saturation is lower because of the lower temperature in winter. The oxygen degree of saturation in the bottom mixed layer on the shelf in winter are higher than in the surface water in winter and the bottom water in summer. In summer the oxygen and carbon dioxide data show extreme variability governed primarily by biological processes. Winter oxygen and pH data, however, do not scatter as much as the summer data and indicate conservative mixing of several sub-surface water masses. The surface water is undersaturated in both oxygen and carbon dioxide and seems to absorb oxygen, but little carbon dioxide, from the atmosphere. Two stations were occupied in the Aleutian Basin. The homogeneous surface layer has the same oxygen and pH values as in the minimum temperature layer observed in the summer by other investigators at the same location. The result substantiates the hypothesis of early investigators that the summer minimum temperature layer is the remnant local winter water. All winter surface waters sampled are undersaturated with respect to oxygen, suggesting that the input of oxygen through the air-sea exchange does not keep up with the rate of upwelling and cooling, which reduces the degree of oxygen saturation. Surface carbon dioxide is also undersaturated because of cooling. 53 references, 12 figures.

16788 **Excess carbon dioxide in the Weddell Sea.** Chen, C.T.A.; Poisson, A. (Oregon State Univ., Corvallis). *Antarctic Journal of the United States;* 74-75(1984).

The authors recently suggested that the antarctic bottom water (AABW) contains little or no excess carbon dioxide because, as is well known, AABW was largely blocked from the air by ice when formed. The conclusion was uncertain, however, because the excess carbon dioxide results which were based on the GEOSECS

(Geochemical Ocean Section Studies) and IGY (International Geophysical Year) data had a large scatter about the oxygen value masking possible small trends of increased near-bottom excess carbon dioxide. To confirm their previous results, they participated in the US - USSR. Weddell Polynya Expedition on the Soviet research vessel/icebreaker Somov between 9 October and 25 November 1981. The more precise Somov data indicated that AABW indeed contains only 6 +/- 5 micromoles per kilogram of excess carbon dioxide. The pre-industrial carbon dioxide concentration in the atmosphere was estimated to be 268 +/- 13 microatmospheres.

16789 **Gas exchange measurements in natural systems.** Broecker, W.C.; Peng, T.H. (Columbia Univ., Palisades, NY). pp 479-493 of Gas transfer at water surfaces. Brutsaert, W.; Jirka, G.H. (eds.). Amsterdam, Netherlands; D. Reidel Publishing Company (1984).

Our direct knowledge of the rates of gas exchange in lakes and the ocean is based almost entirely on measurements of the isotopes ^{14}C, ^{222}Rn and ^{3}He. The distribution of natural radiocarbon has yielded the average rate of CO_2 exchange for the ocean and for several closed basin lakes. That of bomb produced radiocarbon has been used in the same systems. The ^{222}Ra to ^{226}Ra ratio in open ocean surface water has been used to give local short term gas exchange rates. The radon method generally cannot be used in lakes, rivers, estuaries or shelf areas because of the input of radon from sediments. A few attempts have been made to use the excess ^{3}He produced by decay of bomb produced tritium in lakes to give gas transfer rates. The uncertainty in the molecular diffusivity of helium and in the diffusivity dependence of the rate of gas transfer holds back the application of this method. A few attempts have been made to enrich the surface water of small lakes with ^{226}Ra and ^{3}H in order to allow the use of the ^{222}Rn and ^{3}He methods. While these studies give broadly concordant results, many questions remain unanswered. The wind velocity dependence of gas exchange rate on molecular diffusivity also remains in limbo. Finally, the degree of enhancement of CO_2 exchange through chemical reactions has been only partially explored. These remaining uncertainties have relevance to some of the key applications of our knowledge regarding gas exchange rates to environmental problems.

16790 **Carbonate chemistry during WEPOLEX-81.** Chen, C.T.A. (Oregon State Univ., Corvallis). *Antarctic Journal of the United States;* 102-103(1982).

As part of the US-USSR Weddell Polynya expedition (WEPOLEX-81), the author and Soviet counterparts measured acidity and alkalinity of seawater samples on board the ship. Library seawater samples were collected for later measurements of total carbon dioxide (CO_2) and partial pressures of CO_2 and for density and calcium. Some melted ice samples also were collected for measurements of conductivity, chlorinity, density, calcium, and alkalinity. The objectives are (1) to use the calcium and carbonate data as water tracers, (2) to estimate the effect of pack ice on air-sea exchange of gases and on calcium and carbon cycles, (3) to quantify the CO_2 flux between atmosphere and the polar water, (4) to estimate the penetration depth of the fossil fuel CO_2, and (5) to quantify the error in densities calculated from the seawater equation of state.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15437, 15438, 15443, 16387, 16431, 16768

16791 **(IG—86/01) Tritium content of precipitation and surface water in Austria in 1985.** Rank, D.; Rajner, V.; Lust, G. (Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria)). 1986. 27p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700731.

This report includes weighted monthly /sup 3/H-means from 23 precipitation sampling stations, /sup 3/H-concentrations of daily precipitation samples from the station Wien-Arsenal, and /sup 3/H-concentrations of monthly samples from 17 surface water sampling stations of the year 1985.

16792 **Inhomogeneous distribution of tracers in the abyssal southern ocean.** Chen, C.T.A.; Rodman, M.R. (Oregon State univ., Corvallis). *Antarctic Journal of the United States;* 68(1984).

The deep and bottom waters around Antarctica have been reported to be quite homogeneous in radiocarbon concentration and to a somewhat lesser extent in tritium content. The presence of a bottom layer with clearly marked higher tritium values than in the deep water zone [e.g., typical bottom values of more than 0.1 tritium unit (TU) relative to deep water of about 0 TU; 1 TU = 10^{18} T/H where T/H is the isotopic hydrogen ratio $^{3}H/^{1}H$] is well documented. This situation is interpreted to mean that bottom waters contain significant percentages of relatively young waters (i.e., waters of recent surface origin). Chen and Poisson also indicate that the antarctic bottom water (AABW) contains some excess carbon dioxide, again suggesting that a portion of AABW was recently in contact with the atmosphere.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 16782

53 Social And Economic Studies

REFER ALSO TO CITATION(S) 16157

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 15363

55 BIOMEDICAL SCIENCES, BASIC STUDIES

REFER ALSO TO CITATION(S) 16160

16793 **Swine in biomedical research. Vol. 3.** Tumbleson M.E. New York, NY; Plenum Press (1986). 648p. (CONF-8506326—). Plenum Publishing Corp., New York, N.Y.

From Conference on swine in biomedical research; Columbia, MO, USA (17 Jun 1985).

This volume presents information on the following topics: hemodynamic characteristics of the conscious resting pig; cardiovascular and metabolic responses to acute and chronic exercise in swine (ILLEGIBLE) a large animal model for studies (ILLEGIBLE) effects of heparin-protamine interaction in swine - intravenous vs. intraarterial; swine as animal models in cardiovascular research; studies of coronary thrombosis in swine with von Willebrand's disease; role of plasma intermediate and low density lipoproteins in early atherogenesis in hyperlipidemic swine; swine as a model in renal physiology and nephrology; the pig as a model for studying kidney disease in man; hypertension of renal origin and the effects of Captopril in miniature pigs; porcine natural killer/killer cell system; the behavior of pig lymphocyte populations in vivo; a review of spontaneous and experimental porcine eperythrozoonosis; and Sinclair swine melanoma.

5502 Biochemistry

REFER ALSO TO CITATION(S) 15598, 16224, 16842

16794 **(BNL—38848) Carboxyl group reactivity in actin.** Elzinga, M. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 9p. (CONF-8608145—1). NTIS, PC A02/MF A01. File Number DE87003197.

From 6. international conference on methods in protein sequence analysis; Seattle, WA, USA (1 Aug 1986).

While earlier work showed that the carboxyl groups of proteins could be quantitatively coupled to amino groups at pH 4.75 in the presence of EDC and a denaturing agent, the work presented here indicates that under milder conditions the modification of side-

chain carboxyls is limited and somewhat specific. Most of the incorporated glycine ethyl ester (GEE) is apparently bound to five carboxyls. The total GEE incorporated was 3 to 4 moles/mole of protein as measured by an increase in Gly upon acid hydrolysis and amino acid analysis, as well as total radioactivity. 3.55 residues were found in peptides, 2.75 bound to residues 1 to 4, and 0.8 bound to Gly-100. 9 refs., 2 figs., 2 tabs.

16795 **(CONF-8609239—2) Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots.** Zhang, J.S.; Giometti, C.S.; Tollaksen, S.L. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004943.

From Electrophoresis '86: 5th meeting of the International Electrophoresis Society; London, UK (9 Sep 1986).

A simple procedure is described to extract proteins from polyacrylamide gels and subsequently separate them after partial proteolysis. This method is useful for the biochemical characterization of individual proteins in two-dimensional gel patterns and for the identification of both similarities and differences between a pair of related protein spots. Because the number of gel spots to be extracted and the extraction volume can be adjusted in this procedure, differences in the primary structure of both abundant and minor proteins can be investigated. By extracting protein from 10 or more gel spots, enough protein should be obtained to allow amino acid sequencing of peptides that carry significant amino acid differences. 7 refs., 1 fig., 1 tab.

16796 **Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth.** Zhu, Y.S.; Cook, D.N.; Leach, F.; Armstrong, G.A.; Alberti, M.; Hearst, J.E. (Lawrence Berkeley Lab., CA). *Journal of Bacteriology;* **168**: No. 3, 1180-1188(Dec 1986). Contract AC03-76SF00098.

The stability and regulation by oxygen of mRNAs for the photosynthetic apparatus in Rhodobacter capsulatus have been studied by using proflavin to inhibit transcription and by shifting cells from anaerobic to aerobic conditions. The results from the inhibition experiments show that the mRNA for the light-harvesting LH-II polypeptides (β, α) is more stable than that for the light-harvesting LH-I polypeptides (β, α) during anaerobic growth, whereas the mRNAs for the reaction center polypeptides L (RC-L), M (RC-M), and H (RC-H) are less stable than both the LH-I and LH-II mRNAs. When photosynthetic cells were shifted from anaerobic to aerobic conditions, an immediate decrease in the levels of mRNA for the LH-I, LH-II, RC-L, RC-M, and RC-H proteins was observed. The levels of mRNA for the LH-II proteins, however, is more sensitive to oxygen and is reduced faster than the level of mRNA and for the LH-I proteins. These results suggest that oxygen represses the expression of genes coding for the light-harvesting antenna and reaction center complexes and may selectively accelerate the degradation of mRNA for the LH-II proteins. The mRNAs for several enzymes in the bacteriochlorophyll biosynthetic pathway are regulated by oxygen in a similar manner. The authors found that the amounts of mRNAs for carotenoid biosynthetic enzymes, relative to the amounts of mRNAs for LH and RC, increased during the shift from anaerobic to aerobic conditions. They have particularly shown that although the expression of most photosynthetic genes in R. capsulatus is repressed b oxygen, the ctA gene responds to oxygen in an opposite fashion.

16797 **Effects of pH on calcium release from rod outer segment discs.** Whalen, M.M.; Bitensky, M.W. (Los Alamos National Lab., NM). *Federation Proceedings, Federation of American Societies for Experimental Biology;* **45**: No. 6, 1831(May 1986). (CONF-8606151—).

From 76. annual meeting of the Federation of American Society for Experimental Biology; Washington, DC, USA (8 Jun 1986).

Using isolated rod outer segment discs from bovine retina the authors have studied the effect of pH on the release of ^{45}Ca. ^{45}Ca was loaded into the discs using the ATP-dependent calcium uptake activity of the disc membrane. Measurements were made at 1 or 5 min. 250 μM cGMP released 12.9 +/- 7% of the ^{45}Ca over the pH range 6.9-7.9 and 3.1 +/- 2.8% at pH 6.4 (^{45}Ca is only a portion of the total disc calcium; actual release is greater). 25 μM 8-BrcGMP (more potent than cGMP at releasing disc calcium) released 10.6 +/- 2.0% of the ^{45}Ca over the 6.9-7.9 pH range and 1.4 +/- 1.5% at pH 6.4. 250 μM cAMP released 1.0 +/- 1.3% of the ^{45}Ca at pH 6.9. The external calcium level was submicromolar in the above experiments. When the external calcium was micromolar or above there was a release of ^{45}Ca from discs incubated at pH 7.9 as compared to those at pH 6.9 of 11.2 +/- 1.9%. The release was apparently due to pH alone as no cyclic nucleotide was present in the incubation buffers. This release at pH 7.9 was not seen when the external calcium was submicromolar. This data indicates that the ^{45}Ca release being studied is specific to cGMP (as cAMP at the same conc. caused minimal release) and that the ability of cGMP to release calcium from ROS discs is attenuated at pH 6.4 as compared to the release at pH 6.9-7.9 (submicromolar external free calcium). It also indicates that high pH alone can cause calcium release from discs when the external free calcium level is micromolar or above.

16798 **Levels of uracil DNA glycosylase and AP endonuclease in murine B- and T-lymphocytes do not change with age.** Barnard, J.; La Belle, M.; Linn, S. (Univ. of California, Berkeley). *Experimental Cell Biology;* **163**: No. 2, 500-508(Apr 1986). Contract AT03-76EV10109.

Two DNA repair enzyme activities, uracil DNA glycosylase and AP endonuclase, were measured in extracts of T- and B-lymphocytes isolated from mice ranging in age from 3 to 24 months. T- and B-lymphocytes had roughly equal levels of AP endonuclease which did not change appreciably with age. T-lymphocytes had roughly twice as high a level of uracil DNA glycosylase as B-lymphocytes; these levels were not affected by age either. This constancy with age contrasts dramatically with increases in both enzymes-roughly 3-fold on a protein basis or 50-fold on a per cell basis - in a transformed line (MPC-11) derived from a carcinogen-induced lymphocytoma. These results are similar to those obtained with cultured murine fibroblasts, wherein a relative constancy was noted with passage of nontransformed cells, followed by dramatic changes upon transformation. Hence, these enzyme assays do not support the notion of a drop in base excision DNA repair capacity as being a causative factor in aging, but suggest instead that DNA repair properties might differ dramatically in transformed vs nontransformed cells.

5503 Cytology

REFER ALSO TO CITATION(S) 16815, 16840, 16841

16799 **(PNL—5500-Pt.4, pp 39-40) Flow-cytometric analysis of plateau-phase mammalian cell populations.** Nelson, J.M.; Todd, P.; Metting, N.F. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The authors have already shown that starved Chinese hamster ovary (CHO) cells accumulate in the G1 phase and, to a lesser extent, in other parts of the cell cycle, while fed cells continue to progress parasynchronously with a periodicity that reflects the feeding schedule. They have further characterized these kinetic differences by flow-cytometric techniques. DNA distributions were determined as a function of time by fixing trypsinized cells and staining them with the acriflavine-Feulgen procedure for DNA flow-microfluorimetric (FMF) analysis using an EPICS V cell sorter located at Pennsylvania State University. The amount of DNA present and other related characteristics of cells from both fed and starved plateau-phase cultures were monitored as the cultures grew to confluence and then passed into late plateau phase. Additionally, 14-day-old fed and starved plateau-phase cultures were dispersed and the subcultured cells followed, as they passed through their first post-plateau-phase cycles. In addition to verifying the conclusions drawn earlier, these studies also verified the existence of nonincorporating S-phase cells in the starved populations. These cells have S-phase DNA content, even though they do not incorporate [^{3}H]TdR and probably are not synthesizing DNA.

16800 Determination of bacterial cell volume with the coulter counter. Kubitschek, H.E.; Friske, J.A. (Argonne National Lab., IL). *Journal of Bacteriology;* **168**: No. 3, 1466-1467(Dec 1986). Contract W-31-109-ENG-38.

Two methods were used to determine mean volumes of cells of Escherichia coli B/rA in both stationary- and exponential-phase cultures, i.e., (i) electronic measurement with a Coulter Counter-Analyzer system and (ii) biophysical measurement of the total volume and number of cells in sedimented cell pellets. Within experimental errors, the methods gave the same mean cell volumes.

16801 Cell motion, contractile networks, and the physics of interpenetrating reactive flow. Dembo, M.; Harlow, F. (Los Alamos National Lab., NM). *Biophysical Journal;* **50**: No. 1, 109-121(Jul 1986).

In this paper the authors propose a physical model of contractile biological polymer networks based on the notion of reactive interpenetrating flow. They show how their model leads to a mathematical formulation of the dynamical laws governing the behavior of contractile networks. They also develop estimates of the various parameters that appear in their equations, and discuss some elementary predictions of the model concerning the general scaling principles that pertain to the motions of contractile networks.

16802 Numerical studies of unreactive contractile networks. Dembo, M.; Maltrud, M.; Harlow, F. (Los Alamos National Lab., NM). *Biophysical Journal;* **50**: No. 1, 123-137(Jul 1986).

The authors present a finite difference algorithm for integrating the reactive flow model of contractile biological polymer networks on a fixed Eulerian mesh. They discuss the accuracy and limits of the algorithm. To illustrate the application of the algorithm, they carry out a family of computations involving an unreactive contractile network contained in a two-dimensional square reaction vessel. By numerical experiments using different values of the physical parameters of the model, they find that for this simple sort of system two major dynamical modes of contraction are predicted to occur. There is the squeezing type contraction in which the network contracts to a single small clump with gradual expulsion of solution material, and the rending type contraction in which the network tears itself into a number of separate pieces. They find that to a good approximation the transition between the squeezing mode and the rending mode is controlled by a single nondimensional number (the rending number). They discuss the relevance of these results for the analysis of various experimental observations.

5504 Genetics

REFER ALSO TO CITATION(S) 16898, 16899

16803 Hypervirulence of Agrobacterium tumefaciens A281 is encoded in a region of pTiBo542 outside of T-DNA. Hood, E.E.; Helmer, G.L.; Fraley, R.T.; Chilton, M.D. (Washington Univ., St. Louis, MO). *Journal of Bacteriology;* **168**: No. 3, 1291-1301(Dec 1986). Contract AC02-81ER10888.

A binary-vectory strategy was used to study the hypervirulence of Agrobacterium tumefaciens A281, an L,L-succinamopine strain. Strain A281 is hypervirulent on several solanaceous plants. Plasmids were constructed (pCS65 and pCS277) carrying either the transferred DNA (T-DNA) or the remainder of the tumor-inducing (Ti) plasmid (pEHA101) from this strain and tested each of these constructs were tested in trans with complementary each of regions from heterologous Ti plasmids. Hypervirulence on tobacco could be reconstructed in a bipartite strain with the L,L-succinamopine T-DNA and the vir region on separate plasmids. pEHA101 was able to complement octopine T-DNA to hypervirulence on tobacco and tomato plants. Nopaline T-DNA was complemented better on tomato plants by pEHA101 than it was by its own nopaline vir region, but not to hypervirulence. L,L-Succinamopine T-DNA could not be complemented to hypervirulence on tobacco and tomato plants with either heterologous vir region. From these results the authors suggest that the hypervirulence of strain A281 is due to non-T-DNA sequences on the Ti plasmid.

16804 T-DNA and opine synthetic loci in tumors incited by Agrobacterium tumefaciens A281 on soybean and alfalfa plants. Hood, E.E.; Chilton, W.S.; Chilton, M.D.; Fraley, R.T. (Washington Univ., St. Louis, MO). *Journal of Bacteriology;* **168**: No. 3, 1283-1290(Dec 1986). Contract AC02-81ER10888.

A report is given of the molecular characterization of transferred DNA (T-DNA) in leguminous tumors incited by Agrobacterium tumefaciens A281 harboring the tumor-inducing plasmid pTiBo542. The T-DNA is composed of two regions named T/sub L/ (left portion)-DNA and T/sub R/ (right portion)-DNA, in accordance with the nomenclature for the octopine strains. T/sub L/-DNA is defined by several internal HindIII restriction fragments totaling 10.8 kilobase pairs (kbp) in uncloned soybean and alfalfa tumors. Alfalfa tumor DNA may contain one more HindIII fragment at the left end of T/sub L/-DNA that does soybean tumor DNA. T/sub R/-DNA has a 5.8-kbp BamHI-EcoRi internal fragment. All borders other than the left border of T/sub L/-DNA appear to be the same within the detection limits of Southern blot hybridization experiments. The two T-DNA regions are separated by 16 to 19 kbp of DNA not stably maintained in tumors. The distance from the left border of T/sub L/-DNA to the right border of T/sub R/-DNA is approximately 40 kbp. Loci for the mannityl opines are situated in T/sub R/-DNA, based on genetic and biochemical criteria.

5505 Metabolism

REFER ALSO TO CITATION(S) 15335, 15602, 16856, 16878, 16887, 16888, 16906

16805 Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species. Jurik, T.W. (Univ. of Michigan Biological Station, Ann Arbor). *American Journal of Botany;* **73**: No. 1, 131-138(1986). Contract AC02-79EV10091.

Seasonal patterns of leaf photosynthetic capacity and conductance were determined for deciduous hardwood tree species in natural habitats in northern lower Michigan. Leaves of bigtooth aspen and red oak at the top of the canopy had higher maximum CO_2 Exchange Rate (CER) (10-15 $\mu mol\ m^{-2}\ s^{-1}$) than leaves of sugar maple, red maple, red oak, and beech growing in the understory (4-5 $\mu mol\ m^{-2}\ s^{-1}$). In all leaves, CER measured at light-saturation increased to a maximum near the completion of leaf expansion in early June, was constant until mid-September, and then rapidly declined until leaf death. A similar pattern was seen for CER measured in low light (1.5% full sun). Respiration rate in the dark was highest in young leaves and decreased during leaf expansion; a relatively constant rate was then maintained for the rest of leaf lifespan. The seasonal pattern of the initial slope of the light response of CER paralleled the pattern of light-saturated CER. The initial slope in midsummer ranged from values of 37 to 44 $\mu mol/mol$ for species in the understory to 51 and 56 $\mu mol/mol$ for red oak and bigtooth aspen, respectively, at the top of the canopy. Leaf conductance was constant throughout most of leaf lifespan, with some decline occurring in autumn. Leaves at the top of the canopy had higher conductances for water vapor (2-5 mm/s) than leaves in the understory (1-2 mm/s). All species maintained leaf intercellular CO_2 mole fractions (c/sub i/) near 200 $\mu L/L$ until autumn, when c/sub i/ increased during leaf senescence.

16806 Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp. Ohki, K.; Gantt, E.; Lipschultz, C.A.; Ernst, M.C. (Smithsonian Environmental Research Center, Rockville, MD). *Plant Physiology;* **79**: No. 4, 943-948(Dec 1985). Contract AS05-76ER04310.

Phycobilisomes of Tolypothrix tenuis, a cyanobacterium capable of complete chromatic adaptation, were studied from cells grown in red and green light, and in darkness. The phycobilisome size remained constant irrespective of the light quality. The hemidiscoidal phycobilisomes had an average diameter of about 52 nanometers and height of about 33 nanometers, by negative staining. The thickness was equivalent to a physocyanin molecule (about 10 nanometers). The molar ratio of allophycocyanin, relative to other

phycobiliproteins always remained at about 1:3. Phycobilisomes from red light grown cells and cells grown heterotrophically in darkness were indistinguishable in their pigment composition, polypeptide pattern, and size. Eight polypeptides were resolved in the phycobilin region (17.5 to 23.5 kilodaltons) by isoelectric focusing followed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. Half of these were invariable, while others were variable in green and red light. It is inferred that phycoerythrin synthesis in green light resulted in a one for one substitution of phycocyanin, thus retaining a constant phycobilisome size. Tolypothrix appears to be one of the best examples of phycobiliprotein regulation with wavelength. By contrast, in Nostoc sp., the decrease in phycoerythrin in red light cells was accompanied by a decrease in phycobilisome size but not a regulated substitution.

16807 **Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa.** Raps, S.; Kycia, J.H.; Ledbetter, M.C.; Siegelman, H.W. (CUNY, New York, NY). *Plant Physiology;* 79: No. 4, 983-987(Dec 1985).

Phycobilisomes isolated from Microcystis aeruginosa grown to midlog at high light (270 microeinsteins per square meter per second) or at low light intensities (40 microeinsteins per square meter per second) were found to be identical. Electron micrographs established that they have a triangular central core apparently consisting of three allophycocyanin trimers surrounded by six rods, each composed of two hexameric phycocyanin molecules. The apparent mass of a phycobilisome obtained by gel filtration is 2.96 x 10^6 daltons. The molar ratio of the phycobiliproteins per phycobilisome is 12 phycocyanin hexamers:9 allophycocyanin trimers. The electron microscopic observations combined with the phycobilisome apparent mass and the phycobiliprotein stoichiometry data indicate that M. aeruginosa phycobilisomes are composed of a triangular central core of three stacks of three allophycocyanin trimers and six rods each containing two phycocyanin hexamers. Adaptation of M. aeruginosa to high light intensity results in a decrease in the number of phycobilisomes per cell with no alteration in phycobilisome composition or structure.

16808 **Auxin regulation of a proton translocating ATPase in pea root plasma membrane vesicles.** Gabathuler, R.; Cleland, R.E. (Univ. of Washington, Seattle). *Plant Physiology;* 79: No. 4, 1080-1085(Dec 1985). Contract AT06-70ER73019.

Pea root microsomal vesicles have been fractionated on a Dextran step gradient to give three fractions, each of which carries out ATP-dependent proton accumulation as measured by fluorescence quenching of quinacrine. The fraction at the 4/6% Dextran interface is enriched in plasma membrane, as determined by UDPG sterol glucosyltransferase and vanadate-inhibited ATPase. The vanadate-sensitive phosphohydrolase is not specific for ATP, has a K/sub m/ of about 0.23 millimolar for MgATP, is only slightly affected by K^+ or Cl^- and is insensitive to auxin. Proton transport, on the other hand, is more specific for ATP, enhanced by anions ($NO_3^- > Cl^-$) and has a K/sub m/ of about 0.7 millimolar. Auxins decrease the K/sub m/ to about 0.35 millimolar, with no significant effect on the V/sub max/, while antiauxins or weak acids have no such effect. It appears that auxin has the ability to alter the efficiency of the ATP-driven proton transport.

16809 **Carbon dioxide exchange and growth of a pine plantation.** Murphy, C.E. Jr. (E.I. du Pont de Nemours & Co., Aiken, SC). *Forest Ecology and Management;* 11: 203-224(1985). Contract AC09-76SR00001.

The exchange of materials between the atmosphere and terrestrial ecosystems is important to an understanding of the cycling of essential elements, the deposition of materials from the atmosphere and the entrance of pollutants into the forest ecosystems. This paper reports the results of measurements of carbon dioxide exchange in a vigorously growing pine plantation. Measurement data were incorporated into a model used to estimate annual carbon dioxide exchange. The measured annual biomass accumulation in the same plantation was used to determine a carbon dioxide to biomass conversion efficiency. Carbon dioxide exchange was 10.5 t/ha and biomass accumulation was 4.5 t/ha. The conversion efficiency of carbon dioxide to biomass is about 25% less than the theoretical chemical conversion efficiency. Considering the possible errors in both the estimates, this is very good agreement. 27 references, 8 figures, 5 tables.

16810 **Model of carbon dioxide assimilation in Chlamydomonas reinhardii.** Spalding, M.H.; Portis, A.R. Jr. (Michigan State Univ., East Lansing). *Planta;* 164: 308-320(1985). Contract AC02-76ER01338.

A simple model of photosynthetic CO_2 assimilation in Chlamydomonas has been developed in order to evaluate whether a CO_2-concentrating system could explain the photosynthetic characteristics of this alga (high apparent affinity for CO_2, low photorespiration, little O_2 inhibition of photosynthesis, and low CO_2 compensation concentration). Similarly, the model was developed to evaluate whether the proposed defects in the CO_2-concentrating system of two Chlamydomonas mutants were consistent with their observed photosynthetic characteristics. The model treats a Chlamydomonas cell as a single compartment with two carbon inputs: passive diffusion of CO_2, and active transport of HCO_3^-. Internal inorganic carbon was considered to have two potential fates: assimilation to fixed carbon via ribulose 1,5-bisphosphate carboxylase-oxygenase or exiting the cell by either passive CO_2 diffusion or reversal of HCO_3^- transport. Published values for kinetic parameters were used where possible. The model accurately reproduced the CO_2-response curves of photosynthesis for wild-type Chlamydomonas, the two mutants defective in the CO_2-concentrating system, and a double mutant constructed by crossing these two mutants. The model also predicts steady-state internal inorganic-carbon concentrations in reasonable agreement with measured values in all four cases. Carbon dioxide compensation concentrations for wild-type Chlamydomonas were accurately predicted by the model and those predicted for the mutants were in qualitative agreement with measured values. The model also allowed calculation of approximate energy costs of the CO_2-concentrating system. These calculations indicate that the system may be no more energy-costly than CO_4 photosynthesis. 38 references, 4 figures, 4 tables.

5506 Medicine

REFER ALSO TO CITATION(S) 15291

16811 **(DOE/OR/21400—T283) Medical isotopes at Oak Ridge National Laboratory.** Setaro, J.A. (Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005332.

This presentation discusses briefly the overall field of radioisotope applications in medicine, describes the overall field of radioisotope applications in medicine and describes the current involvement of Oak Ridge National Laboratory (ORNL) in this field.

16812 **(FNAL-TM—1428) Surface contouring with a range finder.** Todd, T.J.; Lennox, A. (Fermi National Accelerator Lab., Batavia, IL (USA)). Aug 1986. Contract AC02-76CH03000. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005559.

New patients at the Neutron Therapy Facility must be contoured so that the staff might offer safe and effective treatment. A new system using the lasers and rotating chair that are in the treatment room, a range finder that projects a scale, a contour board marked with polar coordinates, and a swing scale has been implemented. This system significantly improves the accuracy of the contours drawn and should prove to be a time saver in difficult contours, such as those found about the head. Patients will benefit in that the contouring process will be more efficient and accurate. This system may be of use in other situations at Fermilab needing surface contouring through a cross section. Its scale is marked in whole units, and requires low background light conditions to be seen. Modification of the geometry of NTF's system can change the spacing of marks on the scale, but readings would no longer be in 1 cm units, and would require a conversion factor to draw a contour at full scale. The range finder is accurate at distances less than 55 cm from the isocenter. 6 figs.

16813 **(ORNL/TM—10294) Nuclear medicine: Progress report for quarter ending September 30, 1986.** Knapp, F.F. Jr.; Ambrose, K.R.; Goodman, M.M.; Srivastava, P.C. (Oak Ridge National Lab., TN (USA)). Feb 1987. Contract AC05-84OR21400. 20p. NTIS, PC A03/MF A01. File Number DE87005288.

The synthesis of two new dimethyl-branched analogues of 15-(p-iodophenyl)-3,3′-dimethylpentadecanoic acid (DMIPP) is described. Methyl-branching was introduced into the 6- and 9-positions to determine the effect of the position of dimethyl-branching on myocardial uptake and clearance kinetics in rats. The goal of these studies is to maximize heart uptake and retention and minimize blood and liver uptake. The 6,6′-dimethyl- (6,6′-DMIPP) and 9.9′-dimethyl- (9,9′-DMIPP) analogues were prepared by multi-step sequences involving successive Friedel-Crafts/Wolf Kishner reactions on thiophene. Regiospecific para-iodination using thallation and treatment with iodide provided the two new analogues. The 9,9′-[I-125]DMIPP was evaluated in rats and showed somewhat lower uptake than 3,3′-DMIPP (3.13 dose/gm at 5 min versus 4.18) and more rapid clearance (~30% at 1 h). In addition the heart:blood ratios were lower for the 9,9′-dimethyl isomer. These studies have demonstrated the effects of the position of dimethyl substitution on uptake and retention. 1 ref., 3 figs., 2 tabs.

16814 **(PB—87-107892/XAB) Selection of patients for x-ray examinations: skull x-ray examination for trauma.** (Food and Drug Administration, Rockville, MD (USA). Center for Devices and Radiological Health). Jun 1986. 35p. (HHS/PUB/FDA—86-8263). NTIS, PC A03/MF A01.

From a review of the literature and using data provided by a comprehensive FDA study, referral criteria in the form of an algorithm or strategy were developed for the radiological management of patients with head injuries. The algorithm assigns patients to groups of low, moderate, or high risk, according to the severity of their clinical signs and symptoms and the medical history of the trauma. Radiological management of the patient is then based on the risk group.

16815 (PNL—5500-Pt.4, pp 40-41) **Kinetic differences between fed and starved Chinese hamster ovary cells.** Nelson, J.M.; Todd, P.; Metting, N.F. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

When Chinese hamster ovary (CHO) cells are grown as monolayer cultures, they eventually reach a population-density plateau after which no net increase in cell numbers occurs. A manuscript has recently been published which draws attention to the important, and perhaps unexpected, differences in the kinetic status of different types of plateau-phase CHO cells (Nelson, Todd and Metting 1984). The essence of this manuscript and the most significant findings are summarized in this paper.

16816 **Improved delineation of human dopamine receptors using [18F]-N-methylspiroperidol and PET.** Arnett, C.D.; Wolf, A.P.; Shiue, C.Y.; Fowler, J.S.; MacGregor, R.R.; Christman, D.R.; Smith, M.R. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine;* No. 12, 1878-1882(Dec 1986).

The brain uptake of [18F]-N-methylspiroperidol, a butyrophenone neuroleptic with high selectivity for the dopamine receptor, has been measured in three normal human volunteers using positron emission tomography for times up to 12 hr postinjection. These studies demonstrated two unique findings concerning the in vivo distribution of this neuroleptic: (a) it is tightly bound to dopamine D-2 receptors in the caudate-putamen brain regions, and (b) these regions are the only large brain structures which exhibit appreciable long-term retention. In addition, radioactivity clears rapidly from plasma, and the percentage of unchanged [18F]-N-methylspiroperidol in plasma declines rapidly. These results suggest that this compound binds irreversibly to dopamine D-2 receptors, and that there are few if any dopamine D-2 receptors in the human frontal cortex. These studies emphasize not only the importance of characterizing neurotransmitter receptors in living human brain using a ligand labeled with a positron emitting nuclide of sufficiently long half-life to allow monitoring of brain radioactivity distribution for several hours after the injection of radioligand, but also of accurately determining the amount of unchanged tracer in plasma for tracer kinetic modeling.

16817 **Scaling in biological nuclear magnetic resonance spectral distributions.** Lacelle, S. (Iowa State Univ., Ames). *Biophysical Journal;* 50: No. 1, 21-26(Jul 1986). Contract W-7405-ENG-82.

A statistical analysis of the distribution of the eigenvalues of the chemical shift interaction as detected by nuclear magnetic resonance (NMR) spectroscopy in large biological systems is presented in the light of random matrix theory. A power law dependence is experimentally observed for the distribution of the number of eigenvalues, N, of the shielding hamiltonian with ϵ/sub i/ ∂ E as a function of the energy E. From this cumulative distribution of energy levels, N(E), we also obtain a density of states rho(E). The exponent of the energy variation of N(E) and rho(E) are correlated with the dimensionality of the molecular system. A crossover in the values of the exponents is found in passing from low to higher energy in the spectra. Our method classifies and reduces the chemical shift data base of proteins and also demonstrates a degree of regularity in seemingly irregular spectral patterns.

16818 **Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart.** Soine, W.H.; Guyer, C.E.; Knapp, F.F. Jr. (Nuclear Medicine Group, Oak Ridge National Lab., Oak Ridge, TN). *Journal of Nuclear Medicine;* 25: No. 5, 120(1984). (CONF-840619—). Contract W-7405-ENG-26.

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

Ruthenium-97 has attractive properties for use in diagnostic nuclear medicine (T1/2 2.9 d, 216 keV γ in 86% abundance). A five-step route has been developed for the synthesis of β-ruthenocenylalanine (V) as a model ruthenocene-substituted amino acid. Ruthenocene (I) was converted to dimethylaminomethylruthenocene (II) by condensation with [Me/sub 2/N]/sub 2/CH/sub 2/ in HOAc-H/sub 3/PO/sub 4/, and II quaternized to (ruthenocylmethyl) trimethylammonium iodide (III) with excess CH/sub 3/I. Reaction of (III) with the anion of diethylformidomalonate, formed with NaOMe-EtOH, then gave diethyl(ruthenocylmethyl) formamidomalonate (IV). Hydrolysis of (IV) with KOH and cation (AG-50W, X-8) and anion (AG-1, X-2) purification gave B-ruthenocenyalanine (V). Also, III was converted to the corresponding triphenylphosphonium cation (VI) by treatment with phi/sub 3/P. Compounds I-IV were homogeneous by TLC and exhibited the expected NMR and MS properties. Ru-103 (Ru;T1/2 39.4 d) was used in the radiochemical syntheses. Reaction of RuCl/sub 3/ with Na-cyclopentadienide gave Ru-(I); converted to Ru-(V) by the five-step sequence. Ru-(V) showed low pancreatic uptake (mean % ID/gm) in rats (5min, 0.361;60 min, 0.299). Ru(VI) showed low heart uptake (30 min, 0.37) and low heart:blood ratios (1.5:1) in rats. In contrast, Ru-(III) showed good heart uptake in rats (30 min,0.68) and high heart:blood ratios (8:1). These studies indicate that similar /sup 97/Ru-labeled cations are good candidates for further evaluation for heart imaging.

16819 **A calibration phantom for absolute quantitation of radionuclide uptake by SPECT.** Macey, D.J.; De Nardo, G.L.; De Nardo, S.J.; Hines, H.H. (Univ. of California Davis Medical Center, Sacramento, CA). *Journal of Nuclear Medicine;* 25: No. 5, 105(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

Absolute quantitation of radionuclide uptake in small volumes or organs is of interest for nuclear medicine procedures including the estimation of radiation dose in radioimmunotherapy. The use of a calibration phantom for absolute quantitation of a radionuclide in small volumes in a transverse section image of a SPECT phantom with a rotating gamma camera has been investigated. The calibration phantom is a set of 4 tubes filled with a suitable range of specific activity of the radionuclide in solution. This is scanned simultaneously with the SPECT phantom or patient. The tubes can either be placed at appropriate points on the patient boundary or enclosed in a tissue equivalent crescent-shaped phantom which is either attached to the underside of the SPECT table

or placed on the patient to preserve the ellipse for attenuation compensation. A region of interest (ROI) for each tube and volume in the transverse section image was defined with an appropriate threshold of about 10% and the variation of counts in the ROI versus specific activity was found to be linear over the range 1 to 100μCiml/sup -1/. However, the counts from the calibration phantom were found to depend on the total activity in the transverse section slice, the size and effective attenuation coefficient of the transverse section, the reconstruction filter used and the accuracy of boundary detection for attenuation compensation. Preliminary results indicate that this SPECT calibration phantom can be used for absolute quantitation of radionuclide uptake in a selected site in the body, provided attenuation compensation is satisfactory. Also, the method will simplify determination of cumulated activity for radiation dose calculations.

16820 **Which collimator for SPECT with I-123 and CU-67.** De Nardo, G.L.; Macey, D.J.; De Nardo, S.J.; Hines, H.H.; Cole, W.C. (Univ. of California Davis Medical Center, Sacramento, CA). *Journal of Nuclear Medicine;* **25**: No. 5, 105(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

Cu-67 has been suggested for use in radioimmunoimaging and radioimmunotherapy because of its suitable photon energy for imaging (185 keV, 47%) and optimum beta emissions for therapy (0.577 keV, 20%; 0.484 keV, 35%; 0.395 keV, 45%). I-123 has been used in radioimmunoimaging and other procedures. Phantom resolution with I-123 (p,5n) appears comparable to that of Tc-99m using the usual low energy collimators. However, photons of energy greater than 200 keV are also emitted by these radionuclides with relative abundances of 1.3% for Cu-67 and 2.4% for I-123 (p,5n). Collimator septal penetration is a much larger fraction of the photopeak counts and causes degraded uniformity on transverse section images. The authors have examined the performance of 2 low, one medium (300 keV) and one high energy (364 keV) commercially available collimators using Cu-67 or I-123 in a SPECT phantom. The gamma ray spectra, SPECT sensitivity, spatial resolution and uniformity performance were assessed for a rotating gamma camera system. The low energy collimators gave transverse section images with serious nonuniformity artifacts and no possibility of applying an attenuation compensation algorithm. The 300 keV collimator produced better images for I-123 although the performance was degraded relative to Tc-99m and the low energy collimators. However, the 'cold' defect resolution showed little difference between collimators and radionuclides. The authors conclude that the 300 keV collimator represents the better compromise for SPECT tomography with either I-123 (p,5n) or Cu-67.

16821 **Linearity and energy corrections for scintillation cameras used in quantitative single photon emission computed tomography.** Bizais, Y.J.; Rowe, R.W.; Zubal, I.G.; Bennett, G.W.; Brill, A.B. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine;* **25**: No. 5, 87(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

The reconstruction process associated with single photon emission computer tomography (SPECT) greatly amplifies the distortions inherent in the planar projections. The authors show that in order to produce acceptable, quantitative, SPECT reconstructions, the degree of distortion that can be tolerated in the projection data is much lower than that still present after conventional correction algorithms have been applied. For example, flood field non-uniformity corrections and sliding energy window methods are most commonly used, but unacceptable non-uniformity still remains. In order to decrease non-uniformity further, a camera system which permits the determination of the center and width of the photopeak as a function of position on the detector is necessary. The authors have found that a spatially variant, asymmetric, software window, which is normalized to the width of the photopeak, is important in rejecting scatter events more correctly. In addition, an improved software correction for spatial non-linearities is applied. Correcting for spatial non-linearity alone, reduced the non-uniformity of a flood field, imaged with a global asymmetric window (-3.5%, +15%), from 30% to 25%. A sliding window correction for energy distortions alone, resulted in a non-uniformity of 15%. Combination of both the spatial and simple energy distortion correction reduced the non-uniformity to 8%. However, use of the proportional window correction, together with the spatial correction, brought the non-uniformity down to an acceptable 3%. Simulation studies demonstrated the effect of varying energy window characteristics on non-uniformity and scatter rejection.

16822 **Radiopharmaceutical delivery system for controlled arterial concentration in physiologic modeling with computed tomography.** Lambrecht, R.M.; Hanson, J.; Lepera, F. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine;* **25**: No. 5, 89(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

Physiologic models usually require the administration, maintenance and measurement of the specific concentration of the radiotracer in the circulation over specific intervals of time. An instrument has been developed that controls the injection of a radiopharmaceutical so that the arterial concentration of the tracer follows an arbitrary function [e.g., ramp (i.e., quadratic), pulse, exponential, or constant]. The system compensates for radioactive decay and for physiological difference between subjects. The system is made up of a DEC LSI computer contained in a graphics terminal with a printer output. The data from the counting chain is accumulated in a Data Translation clock/counter board. Integral and differential radioactivity is recorded as μCi/mL blood at collection rates of up to 64 k/sec. The tracer is displaced from a syringe with a Harvard infusion/withdrawal pump which was modified to accept an externally determined output. The computer interface to the syringe control is a DT27-81 A/D and D/A board. The analog output allows for control of the flowrate and also acts as a safety shutoff. The program prompts the user for functional form desired, time interval of the study, injection volume and syringe radioactivity. The ideal function is displayed prior to the run. During the run the arterial blood activity is simultaneously measured and displayed. Provision is made for entering physiological data (e.g., blood gases, glucose), subject ID, date, and parameters related to data collection by PET. Conventional detectors and NIM electronics are used to measure the arterial radioactivity.

16823 **In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance.** Adams, D.; De Nardo, G.; Dallas, J.; Erickson, K.; De Nardo, S. (Univ. of California, Davis, CA). *Journal of Nuclear Medicine;* **25**: No. 5, 111(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

Radioimmunotherapy (RIT) shows considerable potential in the treatment of cancer. Recent advances in nuclear magnetic resonance spectroscopy have made in vivo imaging for clinical purposes a reality. Basic biochemical events can be monitored in vivo with /sup 31/p and /sup 13/C topical magnetic resonance (TMR). The authors have developed radiolabeled monoclonal antibodies/antibody fragments as specific RIT agents against several tumor lines. To determine the efficacy of various radiation dosages on tumor targets in a murine model, the authors chose /sup 31/p TMR to allow nondestructive monitoring of tumor metabolism in vivo. Major sources of free energy in cells contain phosphorus; NMR signal intensities are proportional to concentrations of nuclei in a given environment. Relative ratios of phosphorus metabolites describe the physiological status of tissue. TMR of 168 mammary tumors in BALB/C mice indicated that the peak intensity of inorganic phosphate and phosphocreatine (PCr) resonances correlated well with the presence and extent of necrosis. The spectrum of a tumor in which cells were rapidly dividing was significantly different from the necrotic tumor. Relative ratios of ATP and PCr provided information on metabolic function within the tumor. Striking spectral differences between rapidly dividing tumor tissue and necrotic tissue justify use of this method to predict therapeutic efficacy of RIT dosage regimens. This noninvasive determination of metabolic function appears useful in characterizing the extent of radiation-induced necrosis, spontaneous recurrence of tumor tissue, and sequential evaluation of various dose modalities. These data can be used for optimization of human RIT protocols and effective tracking of tumorigenesis in humans.

16824 **Some factors affecting the uptake of iodoamphetamine (IAMP).** Som, P.; Oster, Z.H.; Yamamoto, K.; Meinken, G.E.; Atkins, H.L.; Brill, A.B. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine;* **25**: No. 5, 110(1984). (CONF-840619—).

From 31. annual meeting of the Society of Nuclear Medicine; Los Angeles, CA, USA (5 Jun 1984).

The uptake and distribution of IAMP is believed to reflect the regional blood flow, and distribution of catecholamine binding sites. With the increasing use of this substance for clinical investigation, it appears to be of interest to assess the effect of some hormones and drugs on the biodistribution of IAMP as well as the effects of hypertension. For this purpose the effects of ACTH, metyrapone, and propranolol were studies in mice. ACTH 0.2 U/mouse was injected IM 12 hrs prior to IAMP, metyrapone 0.75 mg/mouse IP 3 hrs prior to IAMP and propranolol 0.15 mg/mouse was given IV 2 hrs before IAMP injection. The IAMP distribution was determined in normotensive and hypertensive Dahl salt-sensitive rats. I-125 IAMP was prepared by a modification of the Winchell method. Tissue distribution was assessed by direct counting of samples and results were expressed as percent injected activity per organ and per gram. Pre-treatment with ACTH was found to lower IAMP concentration (% injected act./g) in brain and adrenals and total activity (% injected act.) in liver. Propranolol caused a decrease in IAMP concentration in blood and brain and metyrapone lowered IAMP concentration in the kidneys. In hypertensive rats IAMP blood concentration and total activity were higher than in the genetically identical normotensive controls. In the heart the concentration remained while the total activity increased. The possible mechanisms of these findings and their clinical significance are discussed.

5507 Microbiology

REFER ALSO TO CITATION(S) 15269, 15602, 15613, 16595, 16796, 16800, 16803, 16804, 16810

16825 (DOE/ER/13101—1, pp 8-12) **Mutants of Escherichia coli affected in inducer exclusion.** Ackerman, E.B. (Univ. of Arkansas, Fayetteville). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

The uptake of carbohydrates by Escherichia coli is affected by two processes: active transport, in which the substrate appears inside the cell chemically unchanged; and by the PEP dependent phosphotransferase system, in which the carbohydrate is phosphorylated as it enters the cell. Although the mechanisms of active transport are entirely different from those of the PT-system, it is known that mutants in the PT-system may show reduced rates of growth on sugars taken up by active transport. Furthermore, it is known that glucose and non-catabolizable analogs of glucose may inhibit the induction of sugars which are taken into the cell by active transport; this phenomenon is known as inducer exclusion. The present work attempts to analyze inducer exclusion on a genetic level by directly generating mutants in inducer exclusion and then locating the locus of the mutation on the chromosome by phage transduction. 3 figures.

16826 (DOE/ER/13101—1, pp 13-17) **Anaerobic chitin degradation as a carbon and hydrogen source for sulfate reduction and methanogenesis in salt marsh bacteria.** Boyer, J.N. (Virginia Institute of Marine Science College of William & Mary, Williamsburg). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Chitin is the major structural component of fungal cell walls and arthropod exoskeletons. Next to cellulose, it is probably the most abundant form of polymerized carbon in the marine system. It is estimated that a single planktonic crustacean, Euphausia pacifica, produces ten billion metric tons of molt chitin annually. Add to that all the micro, meio-, and macrofaunal chitin associated with sediments and the amount of carbon tied up in chitin becomes considerable. Considering the abundance of chitin in nature, very little is known of tis cycling in terms of rates, pathways, or products. Researchers tried to follow the anaerobic degradation of chitin to its end-products and to determine how these products are used by other sediment bacteria. 2 figures, 2 tables.

16827 (DOE/ER/13101—1, pp 18-29) **Feeding relationships of harpacticoid copepods and microbial flora in a salt marsh.** Decho, A.W. (Louisiana State Univ., Baton Rouge). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Benthic harpacticoid copepods represent a predonderate link in the estuarine food web. In the upper food web they serve as food for many invertebrates and fish fry. In the lower portion of the web, it has been suggested that they feed to a large extent on the microbial flora and are therefore important in the recycling of benthic energy. While their relationships with microbes have been the subject of much literature, information regarding the actual food resources of harpacticoids is limited. Most of the studies are strictly laboratory investigations, using food material which is either easily culturable or easily accessible but not necessarily representative of the animals' natural habitat. In small drainage channels of Great Sippewissett March there occurs definite zonation of photosynthetic microbial flora. The relationships of certain harpacticoid copepod species with these photosynthetic microbes (and their associated heterothrophic bacteria) are examined. 5 figures, 4 tables.

16828 (DOE/ER/13101—1, pp 30-36) **Degradation of ortho phenol by streptomycetes in continuous cultures.** Escher, A. (Montana State Univ., Bozeman). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Phenolic compounds are quite commonly used as pesticides. Its degradation in soils is in absence of sun light relatively slow, since it is mediated by microbial activity alone. Investigations showed that mainly some fungi and streptomycetes are responsible for the degradation of these xenobiotic compounds. The mechanisms, however, are not well understood and it appears that traditional microbial assays, i.e. batch cultures and enrichment plates, are not very helpful. The intention of this summer work was to develop some different techniques for a better understanding of the mechanisms and the kinetics of biodegradation of phenolic compounds by streptomycetes. Ortho phenyl phenol has been selected since it is the most toxic compound of the different phenols and its possible products would be less toxic (no secondary inhibition by the product). 1 table.

16829 (DOE/ER/13101—1, pp 37-41) **Chemotaxis and algal attachment of caulobacter.** Friberg, K.M. 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

As a habitat, the ocean is under practically constant nutrient limitation, and the microorganisms living there have had to develop specific feature to be able to survive and proliferate with a meager supply of growth substrates. The prosthecate bacteria, which are distributed generally as oligotrophs in nature, appear to have at least two adaptations that confer on this group of bacteria advantages in scavenging nutrients. First, they have the stalk, an appendage which during starvation periods elongates and in this manner extends the surface of the cell, and second they have a motile swarmer cell, which provides this typically sessile organism with a means of dispersal. This type of cell is a product of every reproductive event, which implies that its role in the welfare of the total population is significant. Its motility alone would disperse the population because its sibling is non-motile; however, it is reasonable to expect that its motion would be directed toward a more favorable environment. In many motile bacteria, it is known that motility can be directed by chemotaxis (a gradient of chemicals). In positive

chemotaxis, the net motion of the organism is along the increasing concentration of a chemical. In negative chemotaxis, the net motion of the organism is along the decreasing concentration of a chemical. Obviously, positive chemotaxis would be beneficial in a nutrient limited habitat. 3 tables.

16830 (DOE/ER/13101—1, pp 42-45) **Preliminary investigation of organisms capable of degrading dieldrin and aromatic compounds: techniques for isolation and characterization.** Harten, B. 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

The degradation of most organic compounds is usually due to microbial activity since nonenzymatic reactions seldom lead to the breakdown of introduced chemicals. Many microorganisms have been shown to degrade aromatic and other hydrocarbon compounds. Two different catabolic processes are responsible for the removal of chemicals from the environment. The first, primary metabolism, refers to the mineralization process in which carbon and energy are derived from the breakdown of the organic molecule by the microorganisms. The second, cometabolism or co-oxidation, refers to the process in which biotransformation of the chemical occurs without the net production of energy or carbon. Organisms use carbon and energy derived from a second substrate for growth and to carry out the cometabolic transformation. The purpose of this study was to test for the presence of primary and cometabolic organisms in the marine environment and to develop techniques for their isolation. Both aromatic compounds and the insecticide dieldrin were used as test compounds. Partial characterization of organisms known to metabolize aromatics was carried out using plasmid screening procedures and thin layer chromatography. One isolate which produced clearing zones on dieldrin was also screen for plasmids. 1 table.

16831 (DOE/ER/13101—1, pp 46-48) **Is the ability of microorganisms to degrade polycyclic aromatic hydrocarbons plasmid mediated?.** Jouper, A. (Gothenberg Univ., NE). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Microorganisms in soil and waters convert many synthetic organic chemicals to inorganic products. Other compounds are transformed by cometabolism. Very little is known about these processes, although the fate of these compounds in the environment is of concern. Catabolism of polycyclic aromatic hydrocarbons (PAH) has been shown to be plasmid mediated in some cases. The researchers examined a PAH-degrader in the Great Sippewissett salt marsh, and if the degradating ability was encoded by a plasmid. The authors also wanted to know if the microorganisms made the PAH water solubie by hydroxylation or be conjugation.

16832 (DOE/ER/13101—1, pp 49-56) **Sheath pigment formation in a blue-green algae lyngbya aestuarii as an adaptation to high light.** Muehlstein, L.K. (Wright State Univ., Fairborn, OH). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

The Great Sippewissett salt marsh has extensive areas of intertidal microbial mats. The top layer of the mats is composed primarily of blue-green algae Lyngbya aestuarii and Microcoleus chthonoplastes. These mats are subjected to long exposures of high light intensity which can potentially cause photodynamic damage to the microorganisms. L aestuarii with heavily pigmented sheaths is often found in these exposed areas. The conditions for sheath pigment formation are not yet understood. Iron concentrations in the environment, periodic desiccation and light intensity are possible factors which may influence sheath pigment formation. From the results of the present study, however, exposure to high light appears to be the primary requirement for sheath pigment formation. The yellow-brown sheath pigment has yet to be fully characterized. The staining of the Lyngbya sheaths is due to the pigment scytonemine and is very effective in reducing incident light. There has been speculation that the sheath pigment evolved in the Precambrian, as a primitive form of protection from high light intensity, including ultraviolet radiation. No recent or detailed chemical analysis of this pigment has been reported. 2 figures, 2 tables.

16833 (DOE/ER/13101—1, pp 55-57) **Diel vertical movements of bacteria in intertidal streams of Sippewissett Marsh.** Noll, K. (Univ. of Illinois, Urbana). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Environmental conditions within the sediment of intertidal streams of salt marshes change drastically in 24 hrs. Light intensity and quality; surface temperature; dissolved oxygen and sulfide concentrations in pore-waters; and depth of watercover all play a role in determining the survival of bacteria living in this environment. The purpose of this report is to observe how bacteria in these areas respond to environmental changes in the course of a day and to attempt to determine what causes these responses. To simplify the system, the work described here was confined to monitoring the effects of light intensity and sulfide under laboratory and field conditions.

16834 (DOE/ER/13101—1, pp 60-68) **Chemtaxis in Spirochaeta aurantia: a possible cation effect. Screening for potential chemorepellents.** Robertson, C.Y. (Skidaway Institute of Oceanography, Savannah, GA). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

The aim of this investigation was to develop a more thorough understanding of chemotaxis in Spirochaeta aurantia. S. aurantia is a true bacteria that possesses a morphology and form of locomotion unique to all other orders of bacteria. Many investigators have attempted to understand the full mechanism behind spirochete motility, but much is left to speculation. Chemoreception in S. aurantia as well as other bacteria is of particular interest; a better understanding of chemoreception and its tie with motility would provide information regarding a very primitive form of behavior. The mechanism by which bacteria distinguish chemical differences in their environment has been well characterized. Cations are known to play important roles in osmoregulation and in the maintenance of enzymes and other macromolecules during anabolic and catabolic processes in bacteria. One goal of this study was to provide preliminary findings on the effects that different salts at varying concentrations have on chemotaxis in S. aurantia. A second goal of this study was to develop an assay that would determine if a substance could serve as a chemorepellent to S. aurantia. Ideally, these findings would provide better understanding of the ecology of S. aurantia as well as provide valuable information leading to a thorough understanding of spirochete behavior. 3 figures, 1 table.

16835 (DOE/ER/13101—1, pp 67-68) **Design and construction of a reactor system to model the anaerobic/oxic wastewater treatment system.** Skladany, G.J. (Clemson Univ., SC). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Secondary wastewater treatment systems are designed to remove suspended solids, soluble organics, and nutrients from wastewater, resulting in an effluent acceptable for disposal into receiving waters. Soluble organics are converted into biomass under aerobic conditions, resulting in a diverse microbial community known as activated sludge. Modifications to the totally aerobic method of treatment have been made in recent years by exposing the activated sludge to an initial anaerobic treatment, followed by an aerobic treatment zone. This modified process has been shown to remove excess phosphate from the wastewater above the amounts needed for microbial growth, and also results in the production of a sludge with improved settling qualities. The basic biological phenomena occurring in this treatment system are poorly

understood, due to both the complex interactions taking place in mixed microbial populations and also the lack of an accurate model of the system for use in the laboratory. Researchers have designed an inexpensive bench-top reactor system that will allow investigation of the microbiology of the anaerobic/oxic treatment system under controlled conditions.

16836 (DOE/ER/13101—1, pp 69-74) **Factors affecting growth inhibition of enteric bacteria by methyl α-D-glucoside.** Sutherland, D. (Creighton Univ., Omaha, NE). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

In previous work it was reported that a marine enteric bacterium, Vibrio parahaemolyticus, responded in a peculiar fashion to analogs of glucose. When methyl α-D-glucoside (αMG) was added to cultures of the organism growing on either mannose or fructose, there was an initial period of inhibition, two to four hrs in low phosphate media (0.6M), which was rapidly overcome and subsequent growth was no longer affected by αMG. This phenomenon has since been termed an escape from inhibition. Also, this work raised the question as to whether this escape differed from that observed in E. coli. The purpose of this experimental work this summer was to determine the escape behavior of E. coli, and to describe the mechanism of escape from the inhibition αMG. In these studies this year, it was decided to work with the more extreme halophilic marine bacterium Vibrio harveyi rather the Vibrio parahaemolyticus.

16837 (DOE/ER/13101—1, pp 78-88) **Investigations into the mechanisms of interaction between to microbial populations in activated sludge.** Wrenn, B.A. (Univ. of Miami, Florida). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

The A/O process for waste water treatment places strong selective pressures on the microbial community of the activated sludge. These pressures result in domination of the sludge by two microbial populations. One of these populations actively accumulates and stores phosphate from the wastewater. The other population has a marked tendency to form large flocs. This second population gives the sludge excellent settling characteristics; the former insures that the effluent water will be low in phosphate. The aim of this study was to supply a quantitative data base which could be applied to the study of the interactions between these two populations. This includes an evaluation of the abilities of isolates to utilize carbohydrates supplied in the culture medium and an assessment of the ability of a phosphate accumulating isolate to grow on metabolites of glucose produced during clumper growth on minimal media. Also, an attempt was made to identify the products of glucose metabolism in a floc-forming isolate. Finally, some preliminary experiments were conducted with the aim of characterizing the nature of the interactions involved in floc-formation.

16838 (DOE/ER/13101—1, pp 94) **Microbial selection in an artificial ecosystem.** Vincent, W.S. (Univ. of Delaware, Newark). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Commercial waste water treatment plants form an artificial ecosystem in which waste water contributes nutrients in very dilute concentrations. These nutrients are then converted into bacterial biomass which is removed or recycled through the system as sludge. The effluent, essentially nutrient-free, is then discharged into streams, lakes and ground water. As sludge is concentrated by gravitational settling, only those bacterial cells which can form clumps will remain in the system. As 20% to 50% of the sludge is recycled with each complete flow through of the system, there is a powerful selection process for cell which cause clumping, as well as those which can be clumped. Twenty-one different bacterial isolates from many sources were tested for their ability to e clumped by a clumping strain (CH-1) isolated from a sludge sample. Only 3 strains, all Acinetobacter-like, isolated from sludge, were competent to be clumped. Four strains of Acinetrobacter lwoffii isolated from soil were not competent. Thus, the water treatment system acts as a highly selecting ecosystem which favors the retention of oligotrophic, clumping bacteria. As clumping is a procedure by which oligotrophic bacteria increase their ability to take advantage of scarce nutrients, the recycled sludge process conserves those cells which clump. Others will be lost from the system.

16839 (DOE/ER/13101—1, pp 90) **Studies on manganese oxidizing spore forming bacteria.** Halvorson, H.O.; Keynan, A.; Tiernan, T. (Brandeis Univ., Waltham, MA). 17 Jun 1986. NTIS, PC A05/MF A01. File Number DE86013180.

In Microbial ecology summer research program. Marine Biological Laboratory, Woods Hole, Massachusetts, June 20-August 26, 1983.

Manganese oxidizing spore forming bacteria were isolated from the Sippewissett Marsh by plotting heated marsh samples on Zobell sea water medium. Eight strains were selected by their ability to oxidize manganese verified by the Leucoberbelin reaction. Strain Mn 8 was selected for further studies. Spores of this strain were prepared as described previously. When examined by flame photometry the spores of this species were found to have a significantly higher concentration Mn^{+} and Fe^{++} than any of several well known soil or marine spore forming bacteria. Further, sporulating cells concentrate Ca^{++} in a high Mg^{++} environment. Spores of Mn 8 had a higher specific density than other marine spore formers investigated; they centrifuged through 62.5 - 65% renographin, while most other spores will pellet through 50-55% renographin. No significant germination occurred in Zobell or other nutrient media, with or without sea water. Over 80% germination occurred when spores were incubated at 30°C for 80 min in medium containing 12.2 mM glucose, 17mM NaCl, 18.7 mM NH_4 Cl, 0.4 mM L-alanine, 0.4 mM adenosine, 1% Tween-80 and 0.01 M Hepes buffer pH 8.2; choramphenical was included to prevent outgrowth. Germination did not require heat activation. During germination loss of refractility is accompanied by swelling with a substantial increase in volume. Although the germination requirements of strain Mn 8 seem to be more complex, they are similar to those of a previously described marine spore former in their requirements for NH_4^{+}, Na^{+}, and relative high pH.

16840 **Increase in cell mass during the division cycle of Escherichia coli B/rA.** Kubitschek, H.E. (Argonne National Lab., IL). *Journal of Bacteriology;* **168**: No. 2, 613-618(Nov 1986). Contract W-31-109-ENG-38.

Increase in the mean cell mass of undivided cells was determined during the division cycle of Escherichia coli B/rA. Cell buoyant densities during the division cycle were determined after cells from an exponentially growing culture were separated by size. The buoyant densities of these cells were essentially independent of cell age, with a mean value of 1.094 g ml^{-1}. Mean cell volume and buoyant density were also determined during synchronous growth in two different media, which provided doubling times of 40 and 25 min. Cell volume and mass increased linearly at both growth rates, as buoyant density did not vary significantly. The results are consistent with only one of the three major models of cell growth, linear growth, which specifies that the rate of increase in cell mass is constant throughout the division cycle.

5509 Pathology

REFER ALSO TO CITATION(S) 15338, 16884, 16886, 16893, 16894

16841 **Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies.** Brechbiel, M.W.; Gansow, O.A.; Atcher, R.W.; Schlom, J.; Esteban, J.; Simpson, D.E.; Colcher, D. (National Cancer Institute, Bethesda, MD). *Inorganic Chemistry;* **25**: No. 16, 2772-2781(30 Jul 1986).

To investigate the ^{111}In labeling of tumor-localizing monoclonal antibodies (MoAb), the chelate 1-(p-isothiocyanatobenzyl)diethylenetriaminepentaacetic acid (p-SCN-Bz-DPTA) (1) and its EDTA analogue (2) have been synthesized.

By the use of a MoAb (B72.3) specific for a high molecular weight antigen (TAG-72) on cells of a colorectal carcinoma grown in nude mice, optimal chemical conditions for MoAb conjugation of those ligands and of the dicyclic and isobutylcarboxy carbonic anhydrides of DTPA and subsequent ^{111}In labeling were determined. All conjugates were shown by a competitive binding assay to retain their specificity and activity in vitro when less than one ligand is protein coupled both prior to and after ^{111}In labeling. Chemical methods for purification of the MoAb were systematically investigated by injection of purified immunoprotein into athymic mice bearing LS-174T tumors that express the TAG-72 antigen. Tissue distribution studies revealed that simple addition of EDTA to labeled immunoglobulins was ineffective at complexing indium not linked to protein by chelates. Similarly, gel chromatography (Sephadex G-50) was not sufficient; rather, size exclusion HPLC had to be employed to remove unreacted ^{111}In and aggregated antibody. To compare the relative utility of the four chelates for ^{111}In diagnostic radioimmunoimaging, scintigraphic images of tumor-bearing mice were obtained and evaluated along with tissue distributions. Results showed that clear images of these solid tissue tumors free of extraneous radiation could be obtained only by using p-SCN-Bz-DTPA purified by HPLC. Methods developed are now being employed in clinical trials for diagnosis of human colorectal cancer. 71 references, 5 figures, 1 table.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 16816

16842 **DNA synthesis studies in pre-meiotic mouse oogenesis.** Sung, W.K.; Hof, J.V.; Jagiello, G. (College of Physicians and Surgeons of Columbia Univ., New York, NY). *Experimental Cell Biology;* 163: No. 2, 370-380(Apr 1986).

DNA fiber autoradiography was used in mouse oogenesis to test Callan's hypothesis that a longer S phase results from a reduction in the number of active initiation sites. The data indicated that the premeiotic increase in the duration of S phase in mouse oogenesis was characterized by a rapid initial rate of chain growth and a larger replicon size when compared with replicating DNA of somatic mouse cells. These findings were at variance with those in mouse spermatogenesis and also did not support the Callan hypothesis of activation site repression.

16843 **Resource utilization by desert quail: time and energy, food and water.** Goldstein, D.L.; Nagy, K.A. (Univ. of California, Los Angeles). *Ecology (English Translation);* 66: No. 2, 378-387(Apr 1985). Contract AC03-76SF00012.

Time-energy budgets (TEB) of Gambel's Quail (Callipepla gambelii) were compiled during two summers in the Colorado Desert of California. Quail spent 6.77 h/d foraging, 6.2 h/d inactive during daylight hours, and 11.02 h/d inactive at night. Field metabolic rate (FMR) calculated from this activity budget was 81.8 kJ/d. Of this, 47.3 kJ/d was expended during foraging, 12.6 kJ/d in daytime inactivity, and 20.4 kJ/d in nighttime inactivity. Despite the extremely hot thermal environment (maximum ambient temperature $\approx$45°C), there was no energy cost above resting levels for thermoregulation. FMR was also measured simultaneously with doubly labeled water (DLW), and averaged 90.8 kJ/d. The FMR of C. gambelii was only 40% of that predicted for a bird of its body mass. Energy assimilation efficiency, measured in laboratory feeding experiments with a mixed seed and arthropod diet, was 60.3%. An individual quail in the field thus required 150.3 kJ/d in its diet, representing a dry matter intake of 8.1 g/d. It was calculated that over the course of a year, a population of Gambel's Quail consumes seeds with a total energy content $\approx$15% as great as that in seeds consumed by a population of desert rodents or harvester ants in the same area. Gambel's Quail thus may be important factors in the competition for resources among desert granivores, particularly because they can eat one of their competitors (harvester ants). 44 references, 2 figures, 7 tables.

5520 Public Health

REFER ALSO TO CITATION(S) 16713, 16726

5530 Agriculture And Food Technology

16844 **(INIS-mf—10552) Application of ionizing radiation in food and feeds processing. Proceedings of seminar.** Hanis, T. (ed.). (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1985. 36p. (In Czech). (CONF-8411284—). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732.

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The seminar heard 8 papers whose topics were: safeguarding the development and testing of RIA kits for veterinary medicine; radicidation of fish meal; effects of radiosterilization on changes in vitamin A content in different fats in mixtures with cereals; technology of radiation processing of feed mixtures and litter for laboratory animals; methods of determining radiation processing of onions; operation of industrial irradiation plant GBZ 81 near Leipzig used for the radurization of onions; replacement of pesticides with radiation disinfestation; radiation sources for irradiation of foods and feeds. (J.P.).

16845 (INIS-mf—10552, pp 7-8) **CSKAE activity in the field of ionizing radiation applications in agriculture and food industry.** Schweiner, Z. (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The results are briefly summed up attained in implementing the nuclear programme in agriculture, namely in the development and clinical testing of RIA kits for use in veterinary medicine. (J.P.).

16846 (INIS-mf—10552, pp 12-16) **Changes due to radiation or thermal sterilization in vitamin A level, acidity number and peroxide value of various fats in mixes with cereals.** Hanis, T.; Pospisil, M.; Klir, P.; Bondy, R.; Mnukova, J.; Krejci, P. (Ceskoslovenska Akademie Ved, Prague. Fyziologicky Ustav; Institut Hygieny a Epidemiologie, Prague, Czechoslovakia; Vyzkumny Ustav Veterinarniho Lekarstvi, Brno-Medlanky, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

Experiments were carried out oriented to destruction changes in fats caused by radiation or heat treatment of food and feed materials. The objective was to find a fat with the highest stability for radiation decontamination and the storage of cereal based diets. The destruction was monitored of vitamin A as the vitamin most sensitive to the efects of ionizing radiation, changes in values of acidity and the peroxide value. The smallest losses of vitamin A and the highest resistance in storage conditions were found in radiation processed mixes containing pork fat and germ oil. (Pu).

16847 (INIS-mf—10552, pp 17-23) **Radiation processing technology for feed mixes and litter for laboratory animals.** Bondy, R.; Burda, Z.; Hanis, T.; Pospisil, M.; Klir, P.; Svoboda, T.; Jelen, P.; Pribylova, M. (Ceskoslovenska Akademie Ved, Prague. Fyziologicky Ustav). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The research was centred on feed mixes for laboratory rats and mice in conditions of germ-free and conventional breeding in isolators. Polyethylene was chosen as the most suitable packing material for radiation processing and subsequent storage. Pelleted diets and litter are packaged in three layers in 400 x 600 mm bags. 25

kGy for germ-free breeding and 50 kGy for gnotobiotic breeds of laboratory rats and mice were determined as being sufficient. The quality of processed diets and their effect on the weight and growth of rats is discussed. (Pu).

16848 (INIS-mf—10552, pp 24-27) **Detection of radiation processing in onions.** Duchacek, V. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

Two breeds of onions were used for irradiation. Both breeds were divided into two parts - the first was irradiated with a dose of 80 Gy and the second served as a control. The two parts were stored under the same conditions. Conductometry, liquid chromatography and spectrophotometry were used for detecting the radiation processing of the onions. Only from the spectrophotometric determination of 2-desoxysaccharides it was possible to safely distinguish irradiated onions from non-irradiated controls throughout storage time. (E.S.).

16849 (INIS-mf—10552, pp 28-30) **Success and future potential of ionizing radiations in solving the food problem in the world.** Pesek, M.; Prasil, Z. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The article informs of the 3rd workshop on radiation effects which was held in Leipzig on September 24 to 28, 1984. Attention is mainly devoted to the industrial irradiation plant GBZ 81. The plant is used for the irradiation of onions to prevent germination. Onions are placed on a revolving annulus and transported between two /sup 60/Co sources where they are irradiated to a depth of 20 cm. The gamma radiation dose (20 to 70 Gy) is controlled using ampoules with Fricke's dosimetric solution. Other papers were centred on the results of irradiation of spices, pharmaceuticals, etc. (E.S.).

16850 (INIS-mf—10552, pp 31-33) **Will radiodisinfestation lead to a reduction in pesticide residues in food?.** Sedlackova, J.; Zuska, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia; Vyzkumny Ustav Potravinarskeho Prumyslu, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The article deals with the possibility of replacing pesticides with radiation disinfestation. The possibility is assessed of using / sup 60/Co, /sup 137/Cs sources or electron accelerators. The broad introduction of radiation disinfestation in practice is precluded by high capital and running costs of the equipment. The advantages are wholesomeness possibility of continuous treatment, reliability and speed of intervention. (E.S.).

16851 (INIS-mf—10552, pp 34-36) **Expanding the possibilities of food and feeds irradiation using UVVVR radiation sources.** Pesek, M.; Prasil, Z.; Rerichova, M.; Cervinsky, J.; Albrechtova, M. (Ustav pro Vyzkum, Vyrobu a Vyuziti Radioisotopu, Prague, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

The Perun and Radegast cobalt irradiation devices are described which have been installed at the Institute for the Research, Production and Use of Radioisotopes (UVVVR) in Prague. The Perun device consists of 21 vertically moving bars into which sources may be placed. Irradiated material is placed into revolving containers. The Radegast device is provided with a simple bar-shaped source. The dimensions of the irradiation chamber are 3x3 m for both sources. Both devices make possible continuous irradiation. The devices may be used for pilot plant irradiation and for irradiating feeds and foods in amounts of tons. (E.S.).

16852 (INIS-mf—10552, pp 9-11) **Proposal for imported fish meal radicidation.** Vacek, K.; Rejholec, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez, Czechoslovakia; Statni Veterinarni Ustav, Terezin, Czechoslovakia). 1985. (In Czech). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700732. (CONF-8411284—).

From Seminar on application of ionizing radiation in food and feeds processing; Prague, Czechoslovakia (1 Nov 1984).

A brief evaluation is presented of the economic benefit and return of investments from a radicidation unit and storehouse for 25,000 tons of imported fish meal which accounts for 50% of current imports. Radicidation would be carried out with a dose of 4 kJ/kg using an electron accelerator at a cost of 18 Czechoslovak crowns per ton. The calculations made proved that capital return would be 1.5 years and economic benefit 6.12 crowns per one crown of expenditure. (J.P.).

16853 **Hyperfiltration of tomato juice: pilot plant scale high temperature testing.** Merlo, C.A.; Rose, W.W.; Pedersen, L.D.; White, E.M.; Nicholson, J.A. (National Food Processors Association, Berkeley, CA). *Journal of Food Science;* **51**: No. 2, 403-407(Mar-Apr 1986). Contract FC07-81ID12227.

A two-stage tubular hyperfiltration (reverse osmosis) pilot plant equipped with 15.6 m^2 of aromatic polyamide thin film composite membranes (ZF99) was studied with tomato juice (4-6% natural tomato soluble solids [NTSS]). It was operated over 100 hr in recirculation and single pass modes. The single pass mode was operated at 33-38 bar (feed inlet pressure) and 70-93°C for 18.2 hr. Stage 1 flux was 48 to 34 $Lm^{-2}hr^{-1}$. Stage 2 flux was 30 to 20 $Lm^{-2}hr^{-1}$. Concentration went to 7.4-9.0% NTSS at 8.6 L/min, and to 6.3-6.4% NTSS at 18.6 L/min. NTSS rejection was >98%. Of permeate samples tested none showed detectable levels of sugars; only 25% showed detectable levels of organic acids.

16854 **Hyperfiltration of tomato juice during long term high temperature testing.** Merlo, C.A.; Rose, W.W.; Pedersen, L.D.; White, E.M. (National Food Processors Association, Berkely, CA). *Journal of Food Science;* **51**: No. 2, 395-398(Mar-Apr 1986). Contract FC07-81ID12227.

A tubular hyperfiltration membrane system was studied with tomato juice in a recirculation mode. Two aromatic polyamide thin film composite membranes (ZF 99) (1.3 m^2) were examined. After 52 hr of operation with tomato juice one membrane exhibited a flux of 39.7 $Lm^{-2}hr^{-1}$ (72°C, 55.2 bar). Another membrane, after 717 hr, gave a flux of 41 $Lm^{-2}hr^{-1}$ (78°C, 41.4 bar) and natural tomato soluble solids (NTSS) rejection of 94 to >98%.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 16871, 16901

16855 **(CONF-861123—5) Long-term loss of radium in 63 subjects first exposed at ages 6 to 46.** Keane, A.T.; Schlenker, R.A. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004689.

From CEC/CEA international workshop on age-related factors in radionuclide metabolism and dosimetry; Angers, France (26 Nov 1986).

The absorbed dose to bone following the deposition of radium in the skeleton is principally determined by its long-term rate of clearance. In mice, rats, and dogs injected with alkaline-earth radionuclides at various ages between puberty and young adulthood, a negative correlation was observed between the age at injection and the skeletal uptake of the radionuclide and, at short times after injection, a positive correlation was observed between the age at injection and the fraction of the contemporary body content of the radionuclide excreted per unit of time, whereas at long times after injection the fractional clearance rate was found to be largely independent of the age at injection. Age-dependent models

of radium retention proposed for man conform to the metabolic observations in animals in their assumption that at long times after intake the fraction of the contemporary body content of radium excreted per unit of time is independent of the age at intake. In this paper, we investigate whether this assumption is supported by the data on the long-term retention of radium in radium-exposed persons.

16856 **(CONF-861123—6) Radium uptake in utero.** Schlenker, R.A.; Keane, A.T. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004711.

From CEC/CEA international workshop on age-related factors in radionuclide metabolism and dosimetry; Angers, France (26 Nov 1986).

A summary of information on a stillborn girl and her mother who had been a radium watch dial painter is provided. Although many dial painters bore children, this is the only example we have of simultaneous radioactivity determinations in mother and child prior to normal delivery. This case provides an opportunity to assess the degree of transfer of radium to the fetus in utero and may be unique in the study of the placental transfer of radium in humans. The mother (Case 00-009) worked at the US Radium Corporation, Orange, New Jersey, for 5 to 7 years beginning in 1918. She accumulated a substantial body burden of ^{226}Ra and ^{228}Ra by mouth tipping of brushes, as was then the custom in the American dial painting industry. Years later, her husband recalled that tissues inside her mouth glowed brightly in the dark and that the front of her clothing often glowed too; he described her as a rapid worker. The child (Case 01-579) was stillborn after a gestation period listed as six months on the certificate of stillbirth. The cause of death is listed as placenta previa. The mother died on the day of birth, February 24, 1928. She was 26 years old. Mother and daughter were buried in the same casket and exhumed together August 9, 1968. 12 refs., 3 tabs.

16857 **(CONF-861123—7) Age dependent retention of ^{212}Pb in the skeleton following ^{224}Ra uptake.** Schlenker, R.A. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004694.

From CEC/CEA international workshop on age-related factors in radionuclide metabolism and dosimetry; Angers, France (26 Nov 1986).

The purpose of this paper is to summarize unpublished analyses of the ^{212}Pb retention data and to provide numerical estimates of the variation of $^{212}Pb/^{224}Ra$ with age in humans. The principal conclusions are that skeletal $^{212}Pb/^{224}Ra$ increases with time after injection, increases with increasing body weight among species, increases with decreasing bone surface-to-volume ratio, and most likely increases with age in humans. These results will have practical implications to the dosimetry of ^{224}Ra and its daughter products in humans. In studies of cancer induction by the ^{224}Ra decay series, subjects have been as young as one year at injection, and a large fraction of the tumors have appeared in subjects exposed as juveniles. The chance that dosimetric data will become available from observations on humans is very small. Interspecies extrapolations such as the one summarized here will be necessary to adjust and refine dosimetry for humans. 13 refs., 6 tabs.

16858 **(JINR—E-19-85-202) Three methods to determine the yields of DNA double-strand breaks.** Erzgraeber, G.; Lapidus, I.L. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700787.

Submitted to the journal Int. J. Radiat. Biol. .

A possibility of determining the yield of DNA double-strand breaks in cells of the Chinese hamster (V79-4) by finding the amount of DNA released as a result of breaks and by determining the relative sedimentation velocity of DNA-membrane complexes affected by ionizing radiations with different physical characteristics is discussed. Results of the analysis are compared with the data obtained by a traditional method of sedimentation in the neutral sucrose density gradient. Comparative characterization of the methods is discussed. The yields of DNA double-strand breaks determined by the suggested independent methods are in good agreement, which opens possibilities of studying induction and repair of double-strand breaks by means of simpler and more reliable methods. 12 refs.; 4 figs.; 2 tabs.

16859 **(ORNL—6338) Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data.** Jones, T.D.; Morris, M.D.; Wells, S.M.; Young, R.W. (Oak Ridge National Lab., TN (USA)). Dec 1986. Contract AC05-84OR21400. 119p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87005223.

Studies conducted during the 1950s and 1960s of radiation-induced mortality to diverse animal species under various exposure protocols were compiled into a mortality data base. Some 24 variables were extracted and recomputed from each of the published studies, which were collected from a variety of available sources, primarily journal articles. Two features of this compilation effort are (1) an attempt to give an estimate of the uniform dose received by the bone marrow in each treatment so that interspecies differences due to body size were minimized and (2) a recomputation of the LD_{50} where sufficient experimental data are available. Exposure rates varied in magnitude from about 10^{-2} to 10^{3} R/min. This report describes the data base, the sources of data, and the data-handling techniques; presents a bibliography of studies compiled; and tabulates data from each study. 103 refs., 44 tabs.

16860 **(PB—87-109773/XAB) Collaborative Radiological Health Laboratory annual report 1985: health effects of prenatal and postnatal whole-body exposure to ionizing radiation in the beagle dog.** (Colorado State Univ., Fort Collins (USA). Collaborative Radiological Health Lab.). Jul 1986. 82p. NTIS, PC A05/MF A01.

The Collaborative Radiological Health Laboratory was established in 1962 by the U.S. Public Health Service and Colorado State University for the purpose of determining in a carefully controlled animal experiment the life-time hazards associated with prenatal and early postnatal exposure to ionizing radiation. The CRHL study is designed to provide information that will facilitate the evaluation of risks to human beings from medical exposure during early development. This is a long-term (lifespan) study of a moderately large and long-lived mammal exposed at one of several times during development to a relatively small and discrete dose of external radiation. Ages-at-irradiation selected for comparison reflect the primary concern with medical exposures during the development period. The basic experiment under the contract contains 1,680 beagles that will be maintained and evaluated for most of their natural lives. Commitment of animals began in December 1967 and was completed in October 1972. The annual report summarizes the current status of the study for the reporting period of November 21, 1984 through November 20, 1985.

16861 **(PB—87-113031/XAB) Joint CDRH (Center for Devices and Radiological Health) and state quality-assurance surveys in nuclear medicine: Phase 2 - radiopharmaceuticals.** Hamilton, D.R.; Evans, C.D. (Food and Drug Administration, Rockville, MD (USA). Center for Devices and Radiological Health). Aug 1986. 52p. (HHS/PUB/FDA—86-8266). NTIS, PC A04/MF A01.

The report discusses survey results on aspects of the quality assurance of radio-pharmaceuticals from 180 nuclear-medicine facilities in the United States. Data were collected from facilities in 8 states. Demographic information about nuclear-medicine operations and quality-assurance programs was gathered by state radiation-control-program personnel. The data collected from the survey show an incomplete acceptance of quality-assurance practices for radiopharmaceuticals. Most of the facilities in the survey indicated that, because an inferior radiopharmaceutical was prepared so infrequently, they did not believe it was cost-effective to perform extensive quality-assurance testing. The Center for Devices and Radiological Health hopes that the information from the survey will stimulate nuclear-medicine professionals and their organizations to encourage appropriate testing of all radiopharmaceuticals.

16862 (PNL—5500-Pt.4, pp 30) **Positive ion irradiation facility.** Braby, L.A. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

MANY QUESTIONS ABOUT THE MECHANISMS OF THE RESPONSE OF CELLS TO IONIZING RADIATION CAN BEST BE INVESTIGATED USING MONOENERGETIC HEAVY CHARGED PARTICLE BEAMS. QUESTIONS OF THE ROLE OF DIFFERENT TYPES OF DAMAGE IN THE LET EFFECT, FOR EXAMPLE, ARE BEING ANSWERED BY COMPARING REPAIR KINETICS FOR DAMAGE INDUCED BY ELECTRONS WITH THAT PRODUCED BY HELIUM IONS. HOWEVER, AS THE MODELS BECOME MORE SOPHISTICATED, THE DIFFERENCES BETWEEN MODELS CAN BE DETECTED ONLY WITH MORE PRECISE MEASUREMENTS, OR BY COMBINING HIGH- AND LOW-LET IRRADIATIONS IN SPLIT-DOSE EXPERIMENTS. THE DESIGN OF THE AUTHORS PRESENT CELL IRRADIATION BEAM LINE HAS LIMITED THE AUTHORS TO IRRADIATING CELLS IN A PARTIAL VACUUM. A NEW WAY TO MOUNT THE DISHES AND BRING THE BEAM TO THE CELLS WAS REQUIRED. SEVERAL MEANS OF IRRADIATING CELLS IN MYLAR-BOTTOM DISHES HAVE BEEN USED AT OTHER LABORATORIES. FOR EXAMPLE AT THE RARAF FACILITY, THE DUAL ION EXPERIMENTS ARE DONE WITH THE DISH BOTTOM SERVING AS THE BEAM EXIT WINDOW BUT THE CELLS ARE IN A PARTIAL VACUUM TO PREVENT BREAKING THE WINDOW. THESE RESEARCHERS HAVE CHOSEN INSTEAD TO USE THE DISH BOTTOM AS THE BEAM WINDOW AND TO IRRADIATE THE ENTIRE DISH IN A SINGLE EXPOSURE. A SPECIAL, VERY FAST PUMPING SYSTEM WILL BE INSTALLED AT THE END OF THE BEAM LINE. THIS SYSTEM WILL MAKE IT POSSIBLE TO IRRADIATE CELLS WITHIN TWO MINUTES OF INSTALLING THEM IN THE IRRADIATION CHAMBER. IN THIS WAY, THE INTERACTION OF ELECTRON AND ION-INDUCED DAMAGE IN CHLAMYDOMONAS CAN BE STUDIED WITH TIME BETWEEN DOSES AS SHORT AS 5 MINUTES.

16863 (PNL—5500-Pt.4, pp 31) **Beta-particle dosimetry.** Roesch, W.C. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The National Council on Radiation Protection chose the members for its Scientific Committee #80, Radiobiology of the Skin. The committee met on April 24-25, 1984, to establish its program. First rough drafts of a report on radiobiology of the skin dealt with one of the principal problems the committee faces, i.e., properly averaging the dose in different parts of the skin.

16864 (PNL—5500-Pt.4, pp 33-34) **Linear energy transfer (LET) effects on repair rate.** Braby, L.A.; Nelson, J.M. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Studies of the repair rates for cells exposed to charged particles of different LET provide important information on the kinds of kinetic processes that should be considered in detailed mathematical models. In a preliminary study with Chlamydomonas reinhardi, the authors tentatively concluded that the repair rate was the same for 13 keV/μm proton and 81 keV/μm ^{3}He ion irradiation, thus suggesting that the same type of damage, repaired by the same process, was predominant in both cases. However, this conclusion was very tentative because of limited precision in the repair rate measurement. Two factors limited that precision: lack of temperature control and limited reliability of the accelerator ion source.

16865 (PNL—5500-Pt.4, pp 34-45) **Improving the precision and range of cell survival assays.** Braby, L.A.; Nelson, J.M.; Lien, M.K. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Most of the biophysical models that the authors would like to evaluate predict nearly equal survival except at very high surviving fractions. Thus, to test these models, survival data must be unusually precise. This requires determining the actual number of cells at risk, counting large numbers of clones, or both. As a part of their continuing program to improve the efficiency of their experiments, the author have automated the counting of clones in split-dose experiments.

16866 (PNL—5500-Pt.4, pp 37) **Dose-rate evidence for two kinds of radiation damage in stationary-phase mammalian cells.** Metting, N.F.; Braby, L.A.; Roesch, W.C.; Nelson, J.M. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Survival based on colony formation was measured for starved plateau-phase Chinese hamster ovary (CHO) cells exposed to 250 kV X-rays at dose rates of 0.0031, 0.025, 0.18, 0.31, and 1.00 Gy/min. A large dose-rate effect was demonstrated. Delayed-plating experiments and dose-response experiments following a conditioning dose, both using a dose rate of 1.00 Gy/min and delays of up to 48 h, were also used to investigate the alternative repair hypotheses.

16867 (PNL—5500-Pt.4, pp 37-39) **Sublethal damage is not the same as potentially lethal damage.** Nelson, J.M.; Metting, N.F.; Braby, L.A.; Roesch, W.C. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The Damage Accumulation Model assumes the existence of both single- and multiple-event damage, with exponential removal of the latter. This damage removal process corresponds to the repair of sublethal damage. Other investigators consider the shoulder on the survival curve, as well as related phenomena, to be a consequence of the same type of biochemical mechanism that leads to the delayed-plating effect, i.e., potentially lethal damage repair. The essential question is, therefore, whether or not the damage removal processes observed in different types of experiments. Survival data from split-dose experiments with starved plateau-phase CHO cells show two simultaneous damage removal processes.

16868 (PNL—5500-Pt.4, pp 41-42) **Survival of subpopulations of plateau-phase Chinese hamster ovary (CHO) cells selected by size.** Metting, N.F.; Braby, L.A.; Nelson, J.M.; Dickes, J.M.; D'Amico, A. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The radiation sensitivity of mammalian cells changes as a function of a cell's position in its replicative cycle, thus complicating the interpretation of experimental results. Results from studies using plateau-phase cell populations are more easily interpreted, since each cell can be considered to be stationary in the cell cycle. However, it has also been shown that even though ~85% of the cells are residing in G1 phase, the other phases are all represented. The authors use these starved, plateau-phase CHO cell populations in dose-rate, split-dose, and delayed-plating radiation response studies. Their work shows that two types of radiation damage repair are occurring simultaneously in this population, with repair half times of about one hour and twenty hours. It is possible that each repair rate reflects the same type of repair, but is manifested in different subpopulations at different rates. The authors investigated this question by irradiating a given population and then, using centrifugal elutriation, gently and aseptically separating it into subpopulations based on cell volume. Each fraction is then assayed independently for its clonogenic potential. To be certain that the sizing criteria reflect the expected stages of the cell cycle, flow cytometry is used to measure the DNA content of the cells in each fraction. Preliminary work has already been done to perfect the elutriation technique for the authors experimental design, using a Beckman's JE-6B elutriation system and rotor.

16869 (PNL—5500-Pt.4, pp 43-46) **Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells.** Newman, C.N. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

In previous reports, the authors demonstrated that exposure of Chinese hamster ovary cells (CHO-K1) to chemical carcinogen or radiation insults results in a transient deoxynucleoside triphosphate (dNTP) pool imbalance. Such an imbalance might be expected to affect the mutagenic response of cells to exposure by increasing the probability for base-misincorporation into de novo synthesized DNA and/or by exerting regulatory controls over the replicative response to exposure. Exposure to UV irradiation, a model mutagen, results in a rapid decrease (five- to ten-fold) in cellular dCTP and a concomitant increase (three- to sixfold) in dTTP, each observed within 10 minutes of exposure, and each persisting for several hours thereafter. However, the target and mechanism causing this response are not defined and, therefore, are presently the object of considerable study. A working hypothesis, now corroborated by data, is that radiation induces perturbations in selected enzyme activities which then perturb prevailing steady-state reaction equilibria, which, in turn, result in the imbalance the authors observe. Key enzyme activities were, therefore, examined in irradiated cells and compared to corresponding activities observed in unirradiated cells.

16870 (PNL—5500-Pt.4, pp 46-47) **Stochastic repair-misrepair model.** Miller, J.H. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The potential to quantitate both damage and mutation at the molecular level opens the possibility for stochastic simulation of mutation induction. The model described in this paper is based on the hypothesis that mutations induced by physical and chemical mutagens result from errors in DNA replication because of damage in the parental template. In bacteria it is meaningful to distinguish direct and indirect effects of DNA damage. Miscoding due to distortion in the DNA helix near a covalently bound adduct is an example of a direct effect. However, DNA damage may also induce responses (e.g., SOS repair) that involve mutator genes. At present, there is no evidence for an SOS-type response in mammalian cells. Nevertheless, mammalian cells do tolerate DNA damage and it is frequently speculated that the process by which the replication complex replitase) bypasses DNA damage is error-prone. In this model the consequences of replication on damaged templates are treated stochastically (i.e., by random variables). The probability distributions that govern the possible outcomes of damage-replitase interactions are the primary input to the model. This information is far from complete; however, formulation of the model will serve to focus on the data needs and perhaps will stimulate new experiments.

16871 (PNL—5500-Pt.4, pp 49-51) **Alpha-particle dose distribution effects at the cellular level.** Fisher, D.R.; Frazier, M.E.; Andrews, T.K. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Ionizing radiations that differ in number, size, and distribution of energy deposition events might be expected to cause different effects for the same absorbed dose. Furthermore, microdosimetry calculations suggest that large variations in biological effectiveness might be expected for internally deposited alpha-emitting radionuclides for the same absorbed dose, depending upon the specific activity and spatial distribution of the sources in tissue. The study described in this article was designed to demonstrate these phenomena in vitro. Cultured Chinese hamster ovary (CHO-K1 BH4) cells were exposed in vitro to inert, insoluble ceramic microspheres in zirconium dioxide labeled with ^{239}Pu. The average exit energy of the 5.15 MeV alpha particle was calculated to be 4.3 MeV. Exposure times varied from four to seven hours to achieve the desired dose level.

16872 (PNL—5500-Pt.4, pp 52) **Implementation of microdosimetry codes on mini-computers.** Hadley, R.T.; Wilson, W.E.; Fisher, D.R. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Computer programs (codes) are required to perform the complex mathematics of internal microdosimetry. Specific energy distributions for internally deposited alpha-emitting radionuclides can be calculated with these codes. The original internal microdosimetry computer codes were designed primarily for evaluation of theoretical formulations. They were written by W. C. Roesch for a large mainframe computer with input variables entered by punched cards. Since then, the codes have continuously updated and revised to meet changing needs and adapted to more modern computer systems. During the past year, the code MICRO was implemented on a supermini-computer system. MICRO calculated probability densities in specific energy for various geometrical configurations of sources (radioactivity) and sites (biological targets) in unit-density media. Implementation of MICRO involved upgrading a previous FORTRAN code. A newer FORTRAN code, LUNG, was also completed during the past year.

16873 (PNL—5750-Pt.5, pp 9-17) **Health physics support and assistance to the Department of Energy.** Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

Pacific Northwest Laboratory functions as the lead laboratory providing health physics support and assistance to the Division of Operational and Environmental Safety, Department of Energy (DOE), on special studies principally associated with the analysis of impact of standards, regulations, and engineering and administrative actions on occupational and environmental exposure. Support and assistance are also provided for other specific tasks or special studies identified by DOE as priorities. The designation of lead laboratory in health physics, with an agreement and budget in place, provides the Division with the additional expertise necessary to respond to the many questions and situations that arise during the operation of their numerous nuclear energy research, development, and demonstration facilities.

16874 (PNL—5750-Pt.5, pp 19) **Technical guidelines for radiological calibrations.** McDonald, J.C.; Roberson, P.L.; Swinth, K.L. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

This program continues to provide technical guidelines for personnel dosimetry calibration procedures at Department of Energy laboratories. This information and guidance will help to optimize equipment and procedures for radiological calibrations. The current tasks include developing a performance data base for radiation protection instruments and preparing guidelines for their calibration. In addition, an intercomparison program for laboratory calibrations is under way.

16875 (PNL—5750-Pt.5, pp 21-23) **Personnel neutron dosimeter evaluation and upgrade program.** Faust, L.G.; Hadlock, D.E.; Brackenbush, L.W.; Parkhurst, M.A.; McDonald, J.C.; Scherpelz, R.I.; Haggard, D.L.; Cummings, F.M.; Endres, G.W.R.; Reece, W.D.; Roberson, P.L. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

A program was initiated during FY 1981 with Pacific Northwest Laboratory as the lead laboratory to (1) evaluate response characteristics of personnel neutron dosimeter systems in current use at several DOE laboratories; (2) develop improved personnel neutron dosimeters, dosimetry systems, and portable instruments; (3) provide technical coordination of work being conducted by various laboratories, universities, and private companies in support of the development efforts; and (4) advance general state-of-the-art of overall neutron dosimetry field.

16876 (PNL—5750-Pt.5, pp 25-26) **Beta measurement evaluation and upgrade.** Swinth, K.L.; Rathbun, L.A.; Roberson, P.L.; Endres, G.W.R. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

This program focuses on the resolution of problems associated with the field measurement of the beta dose component at Department of Energy (DOE) facilities. The change in DOE programs, including increased efforts in improved waste management and decontamination and decommissioning (D & D) of facilities, coupled with beta measurement problems identified at Three Mile Island has increased the need to improve beta measurements. In FY 1982, work was initiated to provide a continuing effort to identify problems associated with beta dose assessment at DOE facilities. The problems identified resulted in the development of this program. The investigation includes (1) an assessment of measurement systems now in use, (2) development of improved calibration systems and procedures, (3) application of innovative beta dosimetry concepts, (4) investigation of new instruments or concepts for monitoring and spectroscopy, and (5) development of recommendations to assure an adequate beta measurement program within DOE facilities.

16877 (PNL—5750-Pt.5, pp 27-28) **Department of Energy Laboratory Accreditation program for occupational exposure measurements.** Roberson, P.L.; Cummings, F.M.; Fox, R.A.; Hooker, C.D. Feb 1986. NTIS, PC A04/MF A01. File Number DE86011909.

In Pacific Northwest Laboratory annual report for 1985 to the DOE Office of the Assistant Secretary for Environment, Safety and Health. Part 5. Overview and assessment.

This program provides research support for the Department of Energy Laboratory Accreditation Program (DOELAP) for personnel dosimetry services. The research effort encompasses development of improved accreditation methods and operation of intercomparison and measurement assurance programs for DOE laboratories. Major accomplishments for FY 1985 included an upgrade in performance of dosimetry measurements to help improve beta-source standardization criteria, preparation of a source intercomparison capability for beta particles, quality assurance procedures and hardware, and the updating of documents required for the operation of the performance testing laboratory used in the accreditation process.

16878 (PNL-SA—14209) **Placental transfer of the actinides and related heavy elements.** Sikov, M.R. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1986. Contract AC06-76RL01830. 13p. (CONF-861123—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004465.

From CEC/CEA international workshop on age-related factors in radionuclide metabolism and dosimetry; Angers, France (26 Nov 1986).

A selective literature review dealing with prenatal exposure of animals and humans to actinides and related heavy elements, comparative aspects of placental transfer and fetoplacental distribution are considered. General patterns have been derived from typical quantitative values, and used to compare similarities and dissimilarities, and to examine factors responsible for observed differences. 37 refs., 2 tabs.

16879 (UCRL—95082) **Personnel neutron dosimetry using CR-39 foils.** Hankins, D.E.; Homann, S.; Westermark, J. (Lawrence Livermore National Lab., CA (USA)). 13 Jan 1987. Contract W-7405-ENG-48. 11p. (CONF-870335—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004355.

From International conference on radiation dosimetry and safety; Taipei, China (2 Mar 1987).

We are using CR-39 foils for personnel nuetron dosimetry at the Lawrence Livermore National Laboratory. We have developed a three-step electrochemical etching procedure that includes low-frequency electrochemical etching at low frequency and at elevated temperatures. Our first etching step is at 60 Hz, 3000 V for 5 hours in a 60°C oven using 6.5 N KOH. The second etching step consists of an additional 23-minute etch at 60°C, 2.0 kHz, and 3000 V, which increases the track size and makes them relatively uniform in size. The final step is a 15-minute post etch at 60°C, which gives the tracks a smoother appearance. The foils are etched in etch chambers that can etch up to 24 foils. Several of these chambers can be used simultaneously with a single power supply. These chambers are rugged and have been used daily for over a year. 8 refs., 6 figs., 1 tab.

16880 **Neptunium-237 inhalation in rats.** Sullivan, M.F.; Ruemmler, P.S.; Buschbom, R.L. (Pacific Northwest Lab., Richland, WA). *Health Physics;* No. 6, 745-753(Dec 1986).

Groups of rats were exposed to aerosols of ^{237}Np nitrate to determine clearance rates, retention and distribution at various intervals after inhalation. Initial lung burdens (ILB) after ^{237}Np inhalation by three treatment groups were 0.12, 0.19 and 0.37 mu Ci/kg, respectively. Radiochemical analyses of animals killed at 4, 8, 14, 28 and 90 d, as well as data for others maintained until they became moribund, showed that their lung clearance followed a three-compartment model, clearance half-times for which were 1, 35, and 10,000 d, respectively. Only 3% of the ILB was retained after 90 d; 12% of that burden had translocated to the skeleton at 750 d; the half-time for skeletal retention was 2500 d. A single tumor was the only malignancy detected in the lungs of the 35 animals allowed to survive the early phase of the study.

16881 **Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{232}UO_2(NO_3)_2$ in the rat.** Ballou, J.E.; Gies, R.A.; Case, A.C.; Haggard, D.L.; Buschbom, R.L.; Ryan, J.L. (Pacific Northwest Lab., Richland, WA). *Health Physics;* No. 6, 755-771(Dec 1986).

Little information exists on the metabolism and potential health effects of ^{233}U and ^{232}U, high-specific-activity U isotopes associated with Th breeder systems. This paper describes the distribution and retention of the two isotopes following inhalation of uranyl nitrate, a simulated process solution. The lungs of rats exposed to $^{233}UO_2(NO_3)_2$ and $^{232}UO_2(NO_3)_2$ aerosols contained from 7 to 23% of the total amount of U retained in the rat after a 30-min inhalation exposure. Uranium was translocated rapidly from the lung and was retained mainly in skeleton, kidney and liver. Amounts equivalent to from one-quarter to one-half the initial lung burden (ILB) of U were excreted in urine the first day after inhalation. Radiation dose estimates based on ^{233}U and ^{232}U retention kinetics indicate that lung and skeleton would be the target organs for delayed radiation effects.

16882 **Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers.** Freeman, S.E.; Blackett, A.D.; Monteleone, D.C.; Setlow, R.B.; Sutherland, B.M.; Sutherland, J.C. (Brookhaven National Lab., Upton, NY). *Analytical Biochemistry;* 158: No. 1, 119-129(Oct 1986).

The authors have developed an alkaline agarose gel method for quantitating single strand breaks in nanogram quantities of nonradioactive DNA. After electrophoresis together with molecular length standards, the DNA is neutralized, stained with ethidium bromide, photographed, and the density profiles recorded with a computer controller scanner. The medium lengths, number average molecular lengths, and length average molecular lengths of the DNAs can be computed by using the mobilities of the molecular length standards. The frequency of single strand breaks can then be determined by comparison of the corresponding average molecular lengths of DNAs treated and not treated with single stand break-inducing agents (radiation, chemicals, or lesion-specific endonuclease). Single stand break yields (induced at pyrimidine dimer sites in uv-irradiated human fibroblasts DNA by the dimer-specific endonuclease from Micrococcus luteus) from our method agree with values obtained for the same DNAs from alkaline sucrose gradient analysis. The method has been used to determined pyrimidine dimer yields in DNA from biopsies of human skin irradiated in situ. It will be especially useful in determining the frequency of single strand breaks (or lesions convertible to single stand breaks by specific cleaving reagents or enzymes) in small quantities of DNA from cells or tissues not amendable to radioactive labeling.

5602 Thermal Effects

16883 **(BG-Trans—15029) Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body.** Yoshie, T.; Yagawa, N. (British Gas Corp., London; Tokyo Gas Research and Development Inst. (Japan)). 1986. Translated from 30th annual technical report of the Tokyo Gas Research and Development Institute, pp 133-142. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87900509.

When assessing heating by infra-red (ir) radiation, the absorption characteristics of the object being heated and its ir radiation transmittivity are important factors. We examined the ir radiation absorption characteristics of human skin and of clothing, and studied the effect of their heating by ir radiation. A non-steady unidimensional heat transfer model was used to examine the effect of the infiltration of ir radiation and of heating on the human body. 7 refs., 18 figs.

5603 Chemicals Metabolism And Toxicology

REFER ALSO TO CITATION(S) 15291, 15293, 15295, 15299, 15319, 15330, 15335, 15336, 15337, 15338, 15339, 15340, 15341, 15342, 15343, 16763, 16764, 16773, 16793

16884 **(BNL—38969) Studies of aluminum in rat brain.** Lipman, J.J.; Brill, A.B.; Som, P.; Jones, K.W.; Colowick, S.; Cholewa, M. (Vanderbilt Univ., Nashville, TN (USA). School of Medicine; Brookhaven National Lab., Upton, NY (USA); Institute of Nuclear Physics, Krakow (Poland)). 1985. Contract AC02-76CH00016. 19p. (CONF-8505112—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE87005261.

From 2. international symposium on the biology and toxicology of metals using nuclear analytical methods; Upton, NY, USA (20 May 1985).

The effects of high aluminum concentrations in rat brains were studied using ^{14}C autoradiography to measure the uptake of ^{14}C 2-deoxy-D-glucose (^{14}C-2DG) and microbeam proton-induced x-ray emission (microPIXE) with a 20-μm resolution to measure concentrations of magnesium, aluminum, potassium, and calcium. The aluminum was introduced intracisternally in the form of aluminum tartrate (Al-T) while control animals were given sodium tartrate (Na-T). The ^{14}C was administered intravenously. The animals receiving Al-T developed seizure disorders and had pathological changes that included cerebral cortical atrophy. The results showed that there was a decreased uptake of ^{14}C-2DG in cortical regions in which increased aluminum levels were measured, i.e., there is a correlation between the aluminum in the rat brain and decreased brain glucose metabolism. A minimum detection limit of about 16 ppM (mass fraction) or 3 x 10^9 Al atoms was obtained for Al under the conditions employed. 14 refs., 4 figs., 1 tab.

16885 **(BNL—39169) In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source.** Jones, K.W.; Schidlovsky, G.; Williams, F.H. Jr.; Wedeen, R.P.; Batuman, V. (Brookhaven National Lab., Upton, NY (USA); Veterans Administration Medical Center, East Orange, NJ (USA)). Dec 1986. Contract AC02-76CH00016. 25p. (CONF-8609203—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005254.

From International symposium on in-vivo body composition studies; Upton, NY, USA (28 Sep 1986).

We have demonstrated that absolute values of bone lead concentrations can be established from well-known physical constants. The correlation between EDTA test results and tibial lead measured by three different groups using three different methods is found, after normalization to common units, to lie on a common curve that, on average, shows the bone lead to be directly proportional to the EDTA results. It appears possible to improve the sensitivity and accuracy of the K x-ray determinations by improved data analysis programs and by increased source intensity and source-detector geometry changes. A present, the method appears capable of measuring lead concentrations at the 5-ppM (wet mass) level with uncertainties of +- 30 to 50% in 20 to 30 minutes measuring time. The uncertainties decrease at higher concentration levels. Measurements of the lead distribution in bone specimens by microscopic techniques would be useful in defining the relative merits of using K or L lead x rays in the measurements. 9 refs., 7 figs., 2 tabs.

16886 **(CONF-8509370—1) Incidence of fusiform rust infection on loblolly pine related to tip moth damage.** Powers, H.R. Jr.; Stone, D.M. (Forest Service, Athens, GA (USA). Southeastern Forest Experiment Station; Forest Service, Grand Rapids, MI (USA). North Central Forest Experiment Station). Sep 1985. Contract AI09-86SR15122. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003912.

From Joint conference of IUFRO working parties on forest gall midges and rusts of pines; Seoul, Korea (16 Sep 1985).

Nantucket pine tip moth (Rhyacionia frustrana) is a common pest over most of the natural range of loblolly pine, causing deformation and growth reduction of seedlings and saplings during the early life of the stand. Fusiform rust (caused by Cronartium quercuum f. sp. fusiforme) is a limiting factor in the production of southern pines throughout a broad area of the southeastern United States, extending from South Carolina to Texas. The target areas on the hosts for both pests are young, succulent shoot tissues. Carbofuran, a systematic insecticide, was used to determine the effect of controlling tip moth on seedlings infected by the fusiform rust organism. Beginning with the 2nd year carbofuran was applied over 4 successive years. The insecticide sharply reduced the incidence of tip moth and increased the height of 5-year-old saplings compared with untreated controls. Usually any treatment that stimulates the growth of pines also results in increased rust infection. However, this was not the case here because untreated saplings had significantly more infection. It is not known whether the increased disease incidence on untreated trees was due to the susceptibility and/or total number of secondary shoots initiated in response to tip dieback caused by the tip moth, or if carbofuran itself has some fungicidal effect resulting in lower infection on treated seedlings. 6 refs., 1 tab.

16887 (CONF-8606161—, pp 9-12) **Separations and synthesis support of pharmacokinetic studies.** Griest, W.H.; Ho, C.H.; Ma, C.Y.; Fleming, G.S.; Guerin, M.R. (Oak Ridge National Lab., TN). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC05-84OR21400.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The research direction taken by ORNL in the OHER Complex Chemical Mixtures Program relies upon radiolabeled and unlabeled model compounds and well-characterized complex mixtures. Current research supported by the separations and synthesis activities of this project includes pharmacokinetic studies in skin and tracheal epithelium. Characterization of bioavailability, uptake, distribution, and metabolism are being conducted. To increase the discrimination of the measurements, a growing emphasis is being placed on the development of improved separations methods, ultimately for the isolation and determination of individual metabolites and also DNA adducts. This paper describes progress in these areas in the past year.

16888 (CONF-8606161—, pp 13-15) **Toxicokinetics of model compounds.** Witschi, H.P.; Smith, L.H. (Oak Ridge National Lab., TN). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC05-84OR21400.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Experiments were performed to test the pharmacokinetic behavior of model compounds. To date, results are available with three model compounds: mercuric chloride, benzo(a)pyrene and azabenzo(a)pyrene, where a substituted N at the 10 position prevents the formation of epoxides. Mercuric chloride was chosen as an example of a potential inorganic environmental contaminant; the other two are model polycyclic hydrocarbons. Known amounts of the isotopically labeled marker compounds mixed with 50 μl of the complex mixtures were applied to the shaved skin of male BALB/c mice. The animals were placed in metabolism cages and urine and feces were collected separately over a 24 hour period. Organs were prepared for liquid scintillation counting (^3H-labelled compounds)

or counted directly in a well-type scintillation counter (^{203}Hg). Results were calculated as percentages of applied dose.

16889 (CONF-8606161—, pp 21-22) **Metabolism of chemical mixtures by the upper respiratory tract.** Dahl, A.R.; Bond, J.A.; Brooks, A.L. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC04-76EV01013.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The major hypothesis being tested is that the respiratory tract, including the nasal region, contributes substantially to the metabolism of inhaled organic compounds. If a substantial portion of an inhaled compound is metabolized in the respiratory tract and the metabolites are either more or less toxic than the parent compound, important toxicological effects could follow. Evidence produced to date that affirms this hypothesis includes: (1) Nasal tissue has been demonstrated to contain high concentrations of xenobiotic metabolizing enzymes. (2) Nasal tissue S-9 homogenate has been demonstrated to have substantial capacity to activate promutagens to mutagens. In fact, for rats, only nasal tissue S-9 was capable of activating some nitrosamines that cause rat nasal cancer indicating that nasal enzymes are important in determining the toxic action of these compounds. (3). In experiments to test nasal tissue xenobiotic metabolic activity in vivo, organic compounds instilled into the nasal cavities of hamsters, dogs and monkeys were metabolized. Toxic metabolites that then appeared in the mucus might be linked to cancer of the nose and alimentary tract. That nasal metabolic activity is important in determining the fate and toxicity of certain inhaled materials is supported by data at hand.

16890 (CONF-8606161—, pp 23-24) **Metabolism of chemical mixtures by the lower respiratory tract.** Bond, J.A.; Dahl, A.R.; McClellan, R.O.; Sabourin, P.J.; Sun, J.D. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC04-76EV01013.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Recent toxicokinetic studies have demonstrated that following inhalation, polycyclic aromatic hydrocarbons and their metabolites are rapidly absorbed from the respiratory tract and widely distributed to all tissues. The rapid absorption of these chemicals from the respiratory tract suggests that the different chemical functional groups represented by the chemicals investigated do not significantly alter the rates of pulmonary absorption of the inhaled chemicals. The data from these studies also indicate that the respiratory tract may in fact be playing a very important role in influencing the disposition of the inhaled chemicals. The research on toxicokinetics of different polycyclic aromatic hydrocarbons has provided important information on the biological fate of inhaled chemicals and has provided the necessary base for formulating and developing hypotheses to better understand the role of the lung in contributing to the metabolic fate of organic chemicals. Studies are under way which are designed to test the hypothesis that site-specific toxicity can be due to the capacity of different portions of the respiratory tract to metabolize inhaled chemicals to intermediates which can react locally with critical cellular macromolecules. The results from these experiments have supported the hypothesis that several portions of the respiratory tract have xenobiotic-metabolizing enzymes which are capable of converting organic chemicals to reactive intermediates.

16891 (CONF-8606161—, pp 31-32) **Uptake and fate of xenobiotics in plants.** Cataldo, D.A.; Bean, R.M.; Fellows, R.J. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Over the past two years, pathways research at PNL has focused on developing a basic understanding of the chemical and metabolic constraints affecting transport of complex organic mixtures from soil to plant to animal. The approach focuses on evaluating chemical and biochemical processes that influence the bioavailability, accumulation, and subsequent metabolic transformation of these materials in plants and soils as well as potential re-release to the environmental through respiration/volatilization. Differences have been observed in the fates of the individual components of complex mixtures to date. In hydroponically grown soybeans, aniline, an aromatic amine, was accumulated with approximately 90% of this being chemically transformed of which ~ 20% was respired and the remainder predominantly localized within the roots of the plant. Phenols, a natural component of plant secondary metabolism, were very rapidly accumulated by the plant and were also transformed (> 90%) with a larger amount of this lost through respiration (~ 35%). The material was also evenly distributed through the plant and was not volatilized from the leaves. Quinoline appeared to accumulation in the leaves with subsequent release from the plant through foliar volatilization. In a hydroponic situation, the indole is rapidly taken up by the plant with the major sites of accumulation being in the roots. In a soil-plant system, the indole is quickly bound to the soil (> 70% in less than 48 h) but is however available to the plants grown in the soil.

16892 (CONF-8606161—, pp 33-35) **Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene.** Shugart, L.; McCarthy, J.; Jimenez, B. (Oak Ridge National Lab., TN). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The authors believe that the problems associated with uncertainties surrounding cellular pharmocokinetics of chemicals can be circumvented to a large extent by allowing the organism to act as the integrator of the unknown parameters of exposure and metabolism and measure the covalent interaction of chemicals which occur with cellular macromolecules. Analysis of DNA and hemoglobin obtained from bluegill sunfish (Lepomis macrochirus) exposed to BaP under laboratory conditions show: (a) the presence of adducts in these macromolecules. This demonstrates that the bluegill sunfish is similar to other organisms in that it possesses cellular enzymes capable of metabolizing BaP to the ultimate carcinogenic form of the chemical; (b) the amount of adduct formation depended upon the temperatures at which the fish were maintained, the difference in adduct formation with both DNA and Hb at the two temperatures is quantitatively similar; (c) BaP adduct formation with fish DNA is like that reported for other organisms; (d) BaP adduct formation with fish Hb is not similar to that reported for mice. Measured concentrations of BaP in soil and vegetation at a contaminated field site were coupled with blood analyses for BaP metabolites in muskrat (Ondatra zibethica) and shrews (Blarina brevicauda) to provide data on possible routes of transfer.

16893 (CONF-8606161—, pp 49-52) **Responses of the respiratory tract to inhaled particle-organic mixtures.** Mauderly, J.L.; Barr, E.B.; Bice, D.E.; Gillett, N.A.; Henderson, R.F.; Jones, R.K.; McClellan, R.O.; Pickrell, J.A.; Wolff, R.K. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC04-76EV01013.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

This project addresses mechanisms by which lung cancer and non-neoplastic lung disease are induced by inhaling complex mixtures containing respirable particles and particle-associated organics. Organics thought responsible for the increased lung cancer associated with cigarette smoke, urban atmospheres and occupational exposures are typically inhaled either adsorbed on particles or in close association with particles. The hypotheses driving the studies in this project are that (1) the health effects of inhaled organics are influenced by their association with particles, and (2) the health effects are influenced by the compositions of both the particles and the organics. The first hypothesis is based on the concept that association of organics with particles acts to prolong retention of the organics in the lung, resulting in a higher time-integrated dose of metabolites to target macromolecules and greater opportunity for initiation of cancer than would occur for organics without the particles. The second hypothesis is based on the concept that, not only do organic species have different carcinogenic potentials, but particle species also have different potentials for causing inflam-

matory and proliferative responses which act to promote carcinogenesis.

16894 (CONF-8606161—, pp 53-55) **Factors affecting the carcinogenicity of inhaled particle-organic mixtures.** Wolff, R.K.; Sun, J.D.; Mitchell, C.E.; Bond, J.A.; Barr, E.B.; Rothenburg, S.J.; Mauderly, J.L. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC04-76EV01013.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

An attempt is made to investigate the release of polycyclic aromatic hydrocarbons (PAH) in the lungs following inhalation of particles with adsorbed PAH and the consequences this has for binding of reactive metabolites to cellular macromolecules. DNA adducts are of particular interest because current concepts in chemical carcinogenesis suggest that their formation is an important step in the initiation process. The approach is to use inhalation exposures to single PAH and well-defined particles. The specific hypotheses that are being tested are: (1) A single inhalation exposure to PAH adsorbed on particles will result in slower release of organic compounds, more persistent levels of covalently bound material and greater time-integrated covalent binding of organic compounds, per unit of inhaled PAH, than inhalation of pure compounds. (2) Repeated exposures to inhaled PAH will result in a buildup of DNA adducts to greater time-integrated levels when PAH are adsorbed on particles than when inhaled as pure compounds. (3) Long-term inhalation exposures to PAH-CB will result in greater lung tumor incidence than exposures to pure PAH, correlated with DNA adduct levels. Carbon black particles were selected as carrier particles.

16895 (CONF-8606161—, pp 71-73) **Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism.** Marchok, A.C.; Flemming, G.S.; Cosma, G.N. (Oak Ridge National Lab., TN). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC05-84OR21400.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

In the past year, three major lines of investigation were followed as part of the complex mixtures program. In the first of these investigations, the uptake and metabolism of the carcinogen, benzo(a)pyrene [B(a)p], by the flow-through tracheal implant (FTTI) is being determined as the first step in studying the alteration of B(a)p utilization and metabolism when it is present in simple and complex mixtures. In the second line of investigation, the acute and subchronic responses of FTTI to two agents, B(a)p and formaldehyde (HCHO), are being determined as the first step in studying the combined action of agents in eliciting tumorigenesis in the respiratory systems. In the third series of studies, the acute and subchronic responses of FTTI to complex mixtures from fuel oils are being investigated as the first step to determining the tumorigenicity of these complex mixtures in the respiratory system. Their findings in these three lines of investigation are presented.

16896 (CONF-8606161—, pp 75-78) **Analysis of DNA adducts using trace organic analytical techniques.** Bean, R.M.; Springer, D.L.; Chess, E.K.; Thomas, B.L.; Mann, D.L. (Pacific Northwest Lab., Richland, WA). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Research studies have related the carcinogenic potential of certain organic compounds with the ability of their metabolites to form chemical bonds with deoxyribunucleic acid (DNA). This relationship suggests that analysis of DNA for bound metabolites can provide an estimate of individual exposure to carcinogens. Methods evolved for determining total DNA binding cannot identify the bound organic compounds, because of the very low concentrations involved. Their recent work has shown that a combination of derivatization and gas chromatography/mass spectrometry can detect benzo[a]pyrene adduct residues at concentrations on the order of 0.1 picomoles per milligram DNA with good specificity. The method involves release of the hydrocarbon residue from the DNA by acid hydrolysis, formation of the methyl, acetyl, or trifluoracetyl derivative, and capillary gas chromatography with single ion mass spectrometer detection. 16 references.

16897 (CONF-8606161—, pp 79-80) **In vivo interactions of chemical mixtures with DNA.** Mitchell, C.E.; Henderson, R.F.; Henderson, T.R.; McClellan, R.O. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract AC04-76EV01013.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Although the molecular mechanisms of chemical carcinogenesis are not fully understood, it is generally thought that one mechanism involves the interaction of chemicals with deoxyribonucleic acid (DNA). There are many modifying factors that affect the fate and interaction of chemicals with DNA One such factor is the level and specificity of the enzymes that are involved in the metabolism of chemicals. Another modifying factor is the simultaneous exposure to more than one compound, where the parent compounds and their electrophilic metabolites compete for the available macromolecular sites. Therefore, prior and simultaneous exposure to chemicals are of practical relevance. The hypotheses that were tested in these studies were (1) that the levels of mixed function oxidases (MFO) are increased in the lung following administration of single compounds or mixtures of compounds, (2) that these increased MFO levels metabolize chemicals to electrophilic forms that bind to cellular DNA, and (3) that chemicals can compete at intracellular macromolecular sites which can be observed by their binding to DNA.

16898 (CONF-8606161—, pp 93-98) **Human lymphocyte mutagenicity assay.** Albertini, R.J.; McGinniss, M.J.; Nicklas, J.A.; O'Neill, J.P. (Univ. of Vermont, Burlington). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The frequency of 6-thioguanine resistance (TG/sup r/) T-lymphocytes in human blood is one measure of somatic gene mutations occurring in vivo. They currently have two methods for detecting and quantitating these rare cells. A simple autoradiographic assay is based on scoring for cells that are resistant to TG inhibition of first-round phytohaemagglutinin (PHA) stimulated DNA synthesis in vitro. Because it is rapid, relatively inexpensive, and has the potential for automation, this assay could be an important tool for human mutagenicity monitoring. Unfortunately, there is no easy method for establishing the mutational origin of TG/sup r/ cells identified in this way, and autoradiography may score for pseudoresistant cells unless special precautions are taken. A newer assay for the TG/sup r/ T-lymphocytes in human blood relies on their direct in vitro cloning in TG. This allows recovery of the in vivo derived variants for studies that now have shown unequivocally their mutational origin and, in many cases, have demonstrated the nature of the mutations at the molecular level. Cloning has become the standard method for quantifying the hypoxyanthine-guanine phosphoribosyl transferase (HPRT) mutants arising in vivo in humans. Their current studies involve both the cloning and the autoradiographic assay. Conditions for the former have been modified in order to optimize single cell cloning and mutant cell recovery. The autoradiographic assay too has been modified, and the results obtained with this assay are being compared with results obtained by clonal assay for hprt mutant T-lymphocytes in the same blood samples.

16899 (CONF-8606161—, pp 99-102) **Genotoxic effects of binary mixtures of polycyclic aromatic hydrocarbons.** Haugen, D.A. (Argonne National Lab., IL). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract W-31-109-ENG-38.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The general goals of this project are to determine what short-term measurements best predict long-term genotoxic effects in animals exposed to multiple chemicals and to learn about the mechanisms of toxicologically significant interactions. They are initially addressing the goals by using binary mixtures of benzo[a]pyrene (BaP) and benz[a]anthracene (BaA) in cellular and cell-free systems

for which the potential number of interactions is minimized. They examined the effects of BaA on the mutagenic activity of BaP as measured in the Salmonella mutagenesis assay, using relatively low and high concentrations of liver microsomes isolated from Aroclor-treated rats. The also assays genotoxicity by measuring binding of [^{3}H-BaP] to calf thymus DNA in vitro. At both the lower and higher microsomal protein concentrations, BaA inhibited binding of [^{3}H-BaP] to calf thymus DNA. These results are in contrast to those obtained with the mutagenesis assay of genotoxicity, in which BaA had opposite effects at the low and high protein concentrations. They are also examining the genotoxicities of BaP/BaA mixtures in the Chinese hamster ovary cell CHO/hypoxanthine-guanosyl-phosphoribosyl-transferase (CHO/HGPRT) assay, with detection of 6-thioguanine resistance.

16900 (CONF-8606161—, pp 103-108) **Environmental biomonitoring with feral rodent species.** Tice, R.R.; Ormiston, B.G.; Boucher, R.; Luke, C.A.; Paquette, D.E. (Brookhaven National Lab., Upton, NY). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

Studies involving the white-footed mouse, Peromyscus leucopus have been performed to evaluate the possible environmental and human health consequences of hazardous waste pollution. The mice were collected at a highly ranked U.S. EPA Superfund site in Camden County, New Jersey. Two principal conclusions can be made from this pilot study. First, the utilization of white-footed mice to detect hazardous levels of genotoxic/cytotoxic pollutants in the environment is feasible. Second, the presence of micronucleated polychromatic erythrocytes (PCEs) in the bone marrow suggests a very recent exposure to genotoxic substances and/or an accumulation of body burdens of such chemicals, while the decrease in bone marrow mitotic index and in %PCE in the peripheral blood suggest that the animals at the hazardous waste site are inhabiting a more toxic environment. 15 references, 2 tables.

16901 (CONF-8606161—, pp 109-110) **Comparative in vitro and in vivo models of cytotoxicity and genotoxicity.** Brooks, A.L.; Mitchell, C.E.; Seiler, S.A. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

To understand the development of disease from inhalation of complex chemical mixtures, it is necessary to use both in vitro and whole animal systems. This project is designed to provide links between these two types of research. The project has three major goals. The first goal is to evaluate the mutagenic activity of complex mixtures and the interactions between different fractions in these mixtures. The second is to develop model cellular systems that help define the mechanisms of genotoxic damage and repair in the lung. The third goal is to understand the mechanisms involved in the induction of mutations and chromosome aberrations in mammalian cells. Research on the measurement and interactions of mutagens in complex mixtures is illustrated by reporting a study using diesel exhaust particle extracts. The extracts were fractionated into ten different chemical classes. Each of the fractions was tested for mutagenic activity in the Ames Salmonella mutation assay. Individual fractions were combined using different permutations. The total mixture was reconstituted and the mutagenic activity compared to the predicted level of activity. Mutagenic activity was additive indicating that the chemical fractionation did not alter the extracts and that there was little evidence of synergistic or antagonistic interaction. To help define the mechanisms involved in the induction of mutations, they have exposed CHO cells to radiation and mutagenic chemicals alone and in combination. In these studies, they have demonstrated that when cells were exposed to 500 rad of x-rays followed by either direct or indirect acting mutagens frequency was less than would be predicted by an additive model.

16902 (CONF-8606161—, pp 111-114) **Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay.** Jones, C.A.; Huberman, E. (Argonne National Lab., IL). Aug 1986. NTIS, PC A06/MF A01. File Number DE86014821. Contract W-31-109-ENG-38;W-7405-ENG-26.

From Conference on health and environmental effects of complex chemical mixtures; Delavan, WI, USA (16 Jun 1986).

The Syrian hamster embryo (SHE) cell transformation assay is unique among the rodent fibroblast transformation systems in that it uses normal, diploid cells. The have collaborated with two independent laboratories under a program sponsored by the National Toxicology Program to evaluate the SHE assay for screening carcinogens. Using coded chemicals, they observed a variable degree of intra- and interlaboratory reproducibility with the system. Overall, there was a good qualitative correlation between the carcinogenicity of the chemicals and their ability to induce morphological cell transformation. Unfortunately, the low level of response and lack of good dose-response relationships with certain chemicals are still major constraints to the use of this system in routine testing. Further consideration needs to be given to developing procedures that select for, or amplify, expression of the transformed phenotype. When SHE cells are treated for three days with a chemical initiator/carcinogen, e.g., benzo(a)pyrene, followed by treatment for four days with a tumor-promoting agent, e.g., phorbol 12-myristate 13-acetate (PMA), the frequency of morphological transformation is significantly enhanced compared to that in cultures treated with the carcinogen alone. Thus, the SHE assay might be useful for the investigation of potential tumor promoters.

16903 (NP—7751304) **Investigations in the toxic effect of H ions and Al ions on seedlings of spruce (Picea abies, KARST.) and beech (Fagus sylvatica, L.) in a solution culture.** Rost-Siebert, K. (Goettingen Univ. (Germany, F.R.). Forschungszentrum Waldoekosysteme - Waldsterben). 1985. 227p. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE87751304.

The hypothesis on forest-dying by Ulrich, which constitutes an ecosystem approach, assumes the continued deposition of air pollutants to lead inter alia to the occurrence of 'acid toxicity' in the area of the roots of forest trees. Acid toxicity is considered a pre-disposing stress factor which damages the roots, causes nutrient deficiency, and plays an essential part in current forest disease in conjunction with accompanying and triggering stress factors. This investigation was aimed to invalidate the part of the hypothesis relating to Al toxicity. The experiments were carried through in culture solutions at continuous solvent flow under controlled external conditions using seedlings of the tree species spruce (Picea abies KARST.) and beech (Fagus silvatica L.) of identified seed origin. As potentially toxic Al ions are dissolved at pH values which, according to literature, are damaging to roots in themselves, both highly acid (-Al)-, and (+Al)-culture solutions were used. That is to say, the investigation covered acid toxicity in two forms, characterized by specific ions. Furthermore, as both the action of H/sup +/ and Al ions depends in part on the concentration of Ca/sup 2+/, the Ca/sup 2+/ concentration was introduced as an additional variable. The laboratory experiments were completed by a seeding test in the field following different soil treatments. The results are discussed in connection with investigations by other authors on H/sup +/ and Al toxicity in tree species, and a mechanism of Al toxicity is outlined which is based on the displacement and replacement of Ca/sup 2+/ by Al ions in the apoplast and at the plasmalemma.

16904 (NP—7770060) **Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands.** Jochheim, H. (Goettingen Univ. (Germany, F.R.). Forschungszentrum Waldoekosysteme - Waldsterben; Kassel Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich 19 - Biologie, Chemie). 1985. 236p. (In German). NTIS (US Sales Only), MF A01. File Number DE87770060.

This investigation aims to give a numeric description of the type and intensity of the chemical modifications of soil from water running down the stem of trees in the area of the roots of old

beech-trees, and to describe the related transformation of the low-growth vegetation. The crucial element in the investigation is the verification of the assumption of 'islands of soil chemistry' having been formed in the immediate vicinity of the stem of old beech trees which do not represent 'normal site conditions' but possess the characteristics of the next more acid buffer range, and that the combinations of plant species produced on such soils, too, display corresponding alterations. For this work 10 stands of old beech-trees of the medium-altitude mountains of northern Hessen were chosen; three of these were Lathyro-Fagetum populations, three Melico-Fagetum populations, and four Luzulo-Fagetum populations. The investigation thus covers the three beech-forest ecosystems predominant in central Europe. In each forest stand, 10 areas at the foot of trees (special sites) and 10 adjacent sites of comparison (ordinary sites) were studied as to their soil chemistry; 20 special and ordinary sites each were studied as to their vegetation. The inventory of the chemical soil conditions and the composition of plant species was carried through as single-time evaluation. The results obtained corroborate the assumption that there are, in all forest populations, significant differences between the areas at the foot of trees and sites of comparison, both as regards soil chemistry and vegetation.

16905 **(VW-FMT—8409V/5) Aldehyde toxicity and load of immissions from motor vehicles.** Kraft, J.; Kuhler, M. (Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Abt. Forschung und Entwicklung). 15 Nov 1984. 23p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE87751301.

The topical public discussion of the subject formaldehyde often is highly emotional and one-sided. To provide a factual basis for statements and discussions, this work tries to distil from the existing literature the current state of scientific knowledge on the action of aldehydes on man and animals. Thus, nothing has so far been reported world-wide to permit the conclusion that formaldehyde causes cancer or has mutagenic or teratogenic effects on man in the concentrations tolerated by man on account of it stinging smell. Neither do the existing epidemiological studies provide any clues to an increased total tumor rate or to an increase of individual tumor rates in persons exposed to formaldehyde. Furthermore, nose cancer diagnosed in rats after inhalation experiments as discussed in the press does not, because of the extremely high formaldehyde concentrations used (14.3 ppm), permit inferences as to the possible effect of the distinctly lower formaldehyde load to which persons can be exposed at work (maximum concentration at work = 1 ppm) or inside buildings (0.1 ppm). In this study, propagation calculations were also carried through for an urban road with a high traffic throughput. This yielded immission concentrations which were distinctly lower than the limiting value recommended by the Federal Health Authority of 0.1 ppm formaldehyde for residential areas.

16906 **Effect of carbon dioxide on sorghum yield, root growth, and water use.** Chaudhuri, U.N.; Burnett, R.B.; Kirkham, M.B.; Kanemasu, E.T. (Kansas State Univ., Manhattan). *Agricultural and Forest Meteorology;* **37**: No. 2, 109-122(Jul 1986). Contract FG02-84ER60253.

The concentration of atmospheric carbon dioxide (CO_2) is rising. The effect of higher than ambient levels of CO_2 on plans grown in the sub-humid central Great Plains of the US has not been investigated. Therefore, an experiment was conducted at Manhattan, Kansas, to study the effect of elevated levels of CO_2 on grain sorghum [Sorghum bicolor (L.) Moench]. During the summer of 1984, the sorghum was grown in rhizotrons in which root and shoot growth could be monitored throughout the growth cycle. The tops of the plants were enclosed in plastic chambers, which contained one of four concentrations of CO_2:330 (ambient), 485, 660, and 795 $\mu l\ l^{-1}$. Enriched CO_2 delayed the boot, half bloom, and soft dough stages. Sorghum grown at elevated concentrations of CO_2 yielded more roots and shoots than plants grown with 330 $\mu l\ l^{-1}$. At all soil-profile depths, root numbers and weights were higher at elevated CO_2 than at ambient CO_2. However, water use per unit dry matter of leaf, stem, root, and grain was decreased 13, 30, 31 and 29%, respectively, in plants grown at 795 $\mu l\ l^{-1}$ CO_2 compared to plants at 330 $\mu l\ l^{-1}$ CO_2. Although elevated CO_2 levels increased the stomatal resistance and leaf temperature, an increase in leaf area indices resulted in a lower canopy resistance. 20 references, 8 figures, 6 tables.

16907 **Microlocalization of brain zinc in zinc-deficient rats.** Wallwork, J.C.; Cholewa, M.; Jones, K.W.; Hanson, A.L.; Slatkin, D.N. (Dept. of Agriculture, Boston, MA). *Federation Proceedings, Federation of American Societies for Experimental Biology;* **45**: No. 4, 1086(5 Mar 1986). (CONF-8604222—). Contract AC02-76CH00016.

From 70. annual meeting of the Federation of American Society for Experimental Biology; St. Louis, MO, USA (13 Apr 1986).

Abnormal behavior and impaired brain function have been attributed to zinc deficiency in experimental animals. The bulk measurement of zinc in various brain parts indicated that this element was highly conserved during zinc deficiency. In this study proton-induced x-ray fluorescence (PIXE) was used to measure and localize zinc in thin brain sections of growth in rats maintained on a zinc-deficient diet (<1 ppm zinc). The zinc-supplemented control animals were fed the same diet with 25 ppm zinc-supplemented water. After 30 days of this regimen the rats were perfused with 0.85% saline until the brains were cleared of blood. The brains were excised, rapidly frozen, and 30-μm thick sections were cut with a stainless steel microtome knife. These sections were backed with adhesive tape and placed in a 50-μm diameter, 2.5-MeV proton beam, and the characteristic K x-rays produced were measured with a Si (Li) x-ray detector. The average brain zinc concentration measured by microPIXE was similar to values obtained from bulk samples with plasma emission spectrometry. There appeared to be a slightly higher concentration of zinc in basal ganglia, cortex, and white matter of zinc-deficient rat as compared to zinc-supplemented controls. The overall brain zinc concentration appeared to be relatively unaffected by zinc deficiency.

16908 **Effects of atmospheric CO_2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil.** Norby, R.J.; O'Neill, E.G.; Luxmoore, R.J. (Oak Ridge National Lab., TN). *Plant Physiology;* **82**: 83-89(1986). Contract AC05-84OR21400.

One-year-old dormant white oak (Quercus alba L.) seedlings were planted in a nutrient-deficient forest soil and grown for 40 weeks in growth chambers at ambient (362 microliters per liter) or elevated (690 microliters per liter) levels of CO_2. Although all of the seedlings became severely N deficient, CO_2 enrichment enhanced growth by 85%, with the greatest enhancement in root systems. The growth enhancement did not increase the total water use per plant, so water-use efficiency was significantly greater in elevated CO_2. Total uptake of N, S, and B was not affected by CO_2, therefore, tissue concentrations of these nutrients were significantly lower in elevated CO_2. An increase in nutrient-use efficiency with respect to N was apparent in that a greater proportion of the limited N pool in the CO_2-enriched plants was in fine roots and leaves. The uptake of other nutrients increased with CO_2 concentration, and P and K uptake increased in proportion to growth. Increased uptake of P by plants in elevated CO_2 may have been a result of greater proliferation of fine roots and associated mycorrhizae and rhizosphere bacteria stimulating P mineralization. The results demonstrate that a growth response to CO_2 enrichment is possible in nutrient-limited systems, and that the mechanisms of response may include either increased nutrient supply or decreased physiological demand. 30 references, 2 figures, 4 tables.

16909 **Letter to the Editor.** Banerjee, S.; Howard, P.H.; Tullis, D.L. (Brookhaven National Lab., Upton, NY). *Environmental Science and Technology;* **19**: No. 4, 374(1985).

A letter to the editor is presented which discusses the interrelationship between toxicity and biodegradability for chlorophenols.

16910 **Effects of elevated CO_2 on plants. III. Flower, fruit and seed production and abortion.** Garbutt, K.; Bazzaz, F.A. (Univ. of Illinois, Urbana). *New Phytologist;* **98**: 433-446(1984).

Four populations of Phlox drummondii and one population each of Datura stramonium and Abutilon theophrasti were grown

in six growth chambers at 300, 600 and 900 μl l^{-1} CO_2, all other environmental variables remaining constant. Changes in timing and numbers of flowers produced were species- and population-dependent. In general, P. drummondii and D. stramonium flowered earlier under high CO_2 while A. theophrasti was not affected. Significantly population x CO_2 interactions were found for several flower production characters in P. drummondii, indicating differential response to elevated CO_2 levels even within a species. In D. stramonium, increased biomass in high CO_2 caused significantly larger fruits to be formed, but there was no significant increase in seed number. In A. theophrasti, individual seed weight increased with increasing CO_2, but total seed weight per plant remained constant. These results are discussed in relation to their possible implications to plant community structure, and the effects on higher trophic levels (e.g. pollinators and plant predators). Qualitative as well as quantitative changes in plants in response to high CO_2 must be studied with care to ensure correct predictions of the effects of the global rise in CO_2. 21 references, 7 figures, 2 tables.

5604 Other Environmental Pollutant Effects

16911 (PB—87-920999/XAB) FDA (Food and Drug Administration) compliance program guidance manual (FY 87). Section 4. Medical and radiological devices. (Food and Drug Administration, Rockville, MD (USA)). 1987. 636p. (FDA/OMO—87/10D). NTIS, PC A99.

Supersedes PB86-920999; Updates and basic manual available on subscription as PB87-920900.

The FDA Compliance Program Guidance Manual provides a system for issuing and filing program plans and instructions directed to Food and Drug Administration Field operations for project implementation. Section IV provides those chapters of the Compliance Program Guidance Manual which pertain to the areas of medical and radiological devices. Some of the areas of coverage include laser and sunlamp standards inspections, compliance testing of various radiation-emitting products such as television receivers and microwave ovens, emergency response planning and policy, premarket approval and device manufacturers inspections, device problem reporting, sterilization of devices, and consumer education programs on medical and radiological devices.

57 HEALTH AND SAFETY

16912 (CONF-8611117—2) Confidence in technologies: Interactions between publics and industries. Wolfe, A.K. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005363.

From Annual meeting of the Society for Risk Analysis; Boston, MA, USA (9 Nov 1986).

Confidence in the safety of industrial or technological activities is examined in three communities hosting industrial facilities, as well as in a series of communities affected by low-flying jet aircraft. The case studies produced a number of findings which have significant implications for risk communication, including: (1) several audiences for risk communicators exist, even within a single community; (2) different risk messages may be appropriate; and (3) historical and continuing interactions between industries and communities affect the types of situations which escalate to crises as well as the types of risk messages which are appropriate and trusted within industrial communities.

16913 (CONF-8611117—3) An experiment in combining estimates of uncertainty. Tonn, B.; Goeltz, R. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004279.

From Annual meeting of the Society for Risk Analysis; Boston, MA, USA (9 Nov 1986).

This research explores how subjects combine estimates of uncertainty. Four major computer programs written in Common Lisp asked the subjects questions about the likelihoods of single events and conjunctions of independent events. The results suggest that the subjects did not widely use the product rule, appeared to use a minimum rule, and varied the combining heuristic as the magnitude of the likelihoods varied. The results suggest that inaccurate risk perceptions and judgments may, in part, result from deficient reasoning about uncertainty. Future research should encompass dependent events and time and explore other methods of representing uncertainty.

16914 (EGG—10282-1122) Role of the Federal Radiological Monitoring and Assessment Center (FRMAC) following a radiological accident. Doyle, J.F. III. (EG and G Energy Measurements, Inc., Las Vegas, NV (USA)). 1986. Contract AC08-83NV10282. 3p. (CONF-8609147—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002863.

From American Nuclear Society annual meeting; Bethesda, MD, USA (15 Sep 1986).

The Federal Radiological Emergency Response Plan (FRERP) calls for the Department of Energy to establish a Federal Radiological Monitoring and Assessment Center (FRMAC) immediately following a major radiological accident to coordinate all federal off-site monitoring efforts in support of the State and the Cognizant Federal Agency (CFA) for the facility or material involved in the accident. Some accidents are potentially very complex and may require hundreds of radiation specialists to ensure immediate protection of the public and workers in the area, and to identify priorities for the Environmental Protection Agency (EPA) long-term efforts once the immediate protective actions have been carried out. The FRMAC provides a working environment with today's high technology tools (i.e., communication, computers, management procedures, etc.) to assure that the State and CFA decision makers have the best possible information in a timely manner on which to act. The FRMAC planners also recognize an underlying responsibility to continuously document such operations in order to provide the State, the CFA, and the EPA the technical information they will require for long term assessments. In addition, it is fully recognized that information collected and actions taken by the FRMAC will be subjected to the same scrutiny as other parts of the accident and the overall response.

16915 (UCRL—53757) Powered air-purifying respirator study: Final report. da Roza, R.A.; Cadena-Fix, C.A.; Kramer, J.E. (Lawrence Livermore National Lab., CA (USA)). Jul 1986. Contract W-7405-ENG-48. 33p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005579.

Three brands of powered air-purifying respirators were subjected to a simulated-work-place study. They were worn by six human subjects while working at 80% of their cardiac reserve on a treadmill. The air flow into the respirator was controlled to match that of a respirator with a newly charged battery and with various stages of battery discharge and filter plugging. The simulation took place in a large quantitative fit test chamber containing PEG 400 aerosol. The penetration of aerosol into the breathing zone of the respirator, the pressure in it, and the air flow were monitored while the subject was warming up as well as during the 80% tests. The exercises recommended in ANSI Z88.2 for helmets were also used after the 80% tests were completed. The subjects were tested clean shaven, with three days' growth of stubble, and with a two-month beard growth. A striking result was that the aerosol penetration into the two-helmet respirators increased dramatically as the subjects work rate increased. On the other hand, penetration into the half mask did not change with work rate. The penetration increased as the air flow was decreased in all cases for the helmets and for beard and stubble cases for the half mask. However, for he tight-fitting half mask on a clean-shaven face, the average penetration stayed below 0.001 for all flows. 18 figs, 5 tabs.

16916 (UCRL—94676) Filter penetration measurements using the condensation nuclei counter and the aerosol photometer. Biermann, A.H.; Bergman, W. (Lawrence Livermore National Lab., CA (USA)). 15 Nov 1986. Contract W-7405-ENG-48. 9p. (CONF-8611121—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003239.

From Conference on chemical defense research; Aberdeen Proving Grounds, MD, USA (15 Nov 1986).

Measurements of respirator protection factors for aerosols can differ, depending on the analytical technique used for particle detection. We have conducted both theoretical and experimental comparisons of the responses of two aerosol instruments used to

assess respirator protection - the light-scattering photometer and condensation nuclei counter. Results of our experiments indicate that differences in penetration measurements of the two instruments can vary up to a factor of ten. These variations can be attributed to: the response function of the photometer, the filter penetration, and the distribution of the test aerosol - all of which depend on particle size. In general, test aerosols with larger standard deviations in size produce greater discrepancies. For sufficiently large penetrations due to leakage, however, the instruments report penetrations that approach the same value, regardless of the size distribution of the test aerosol. 19 refs., 5 figs.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 15437, 15438, 16696, 16747, 16748, 16767

16917 (INIS-mf—10556-Vol.2, pp 653-659) **Ice ages.** Duplessy, J.-C. (Centre National de la Recherche Scientifique, 91 - Gif-sur-Yvette, France. Centre des Faibles Radioactivites). 1984. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700738. (CONF-8408138—Vol.2).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The Earth's climate undergoes great changes in cycles of 10/sup 4/ to 10/sup 5/ years. Deep sea sediments contain proof of these changes. The critical parameter is the O/sup 18//O/sup 16/ isotope ratio. The astronomical theory is discussed of ice ages based on the changes in the shape of the Earth's orbit around the sun. Forecasts for the future are given - in the coming years the climate is expected to get warmer owing to increased CO/sub 2/ levels in the atmosphere, and then a long cooler period is expected to follow. (M.D.).

16918 **(LA—10859-MS) Fran Ridge horizontal coring summary report hole UE-25h No. 1, Yucca Mountain Area, Nye County, Nevada.** Norris, A.E.; Byers, F.M. Jr.; Merson, T.J. (Los Alamos National Lab., NM (USA)). Oct 1986. Contract W-7405-ENG-36. 80p. NTIS, PC A05/MF A01. File Number DE87004764.

Hole UE-25h No. 1 was core drilled during December 1982 and January 1983 within several degrees of due west, 400 ft horizontally into the southeast slope of Fran Ridge at an altitude of 3409 ft. The purpose of the hole was to obtain data pertinent for radionuclide transport studies in the Topopah Spring Member of the Paintbrush Tuff. This unit had been selected previously as the host rock for the potential underground nuclear waste repository at Yucca Mountain, adjacent to the southwestern part of the Nevada Test Site. The hole was core drilled first with air, then with air mist, and finally with air, soap, and water. Many problems were encountered, including sloughing of tuff into the uncased hole, vibration of the drill rods, high rates of bit wear, and lost circulation of drilling fluids. On the basis of experience gained in drilling this hole, ways to improve horizontal coring with air are suggested in this report. All of the recovered core, except those pieces that were wrapped and waxed, were examined for lithophysal content, for fractures, and for fracture-fill mineralization. The results of this examination are given in this report. Core recovery greater than 80% at between 209 and 388 ft permitted a fracture frequency analysis. The results are similar to the fracture frequencies observed in densely welded nonlithophysal tuff from holes USW GU-3 and USW G-4. The fractures in core from UE-25h No. 1 were found to be smooth and nonmineralized or coated with calcite, silica, or manganese oxide. Open fractures with caliche (porous, nonsparry calcite) were not observed beyond 83.5 ft, which corresponds to an overburden depth of 30 ft.

16919 **(LBL—22559) Coupled processes in single fractures, double fractures and fractured porous media.** Tsang, C.F. (Lawrence Berkeley Lab., CA (USA)). Dec 1986. Contract AC03-76SF00098. 20p. (CONF-861246—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004477.

From Workshop on numerical modeling for radioactive waste repositories; Madrid, Spain (10 Dec 1986).

The emplacement of a nuclear waste repository in a fractured porous medium provides a heat source of large dimensions over an extended period of time. It also creates a large cavity in the rock mass, changing significantly the stress field. Such major changes induce various coupled thermohydraulic, hydromechanic and hydrochemical transport processes in the environment around a nuclear waste repository. The present paper gives, first, a general overview of the coupled processes involving thermal, mechanical, hydrological and chemical effects. Then investigations of a number of specific coupled processes are described in the context of fluid flow and transport in a single fracture, two intersecting fractures and a fractured porous medium near a nuclear waste repository. The results are presented and discussed.

16920 **(PNL—6087) Evaluation and status report on HYDROCOIN at midway (HYDROCOIN: An international project for studying groundwater hydrology modelling strategies).** Cole, C.R. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1986. Contract AC06-76RL01830. 92p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005564.

The US Department of Energy (DOE) is participating in the international hydrologic code intercomparison (HYDROCOIN) project organized by the Swedish Nuclear Power Inspectorate (SKI) for the purpose of improving our knowledge about the influence of various strategies for ground-water flow modeling for the safety assessment of final repositories for nuclear waste. The HYDROCOIN project consists of three levels of effort: Level One is concerned with verifying the numerical accuracy of codes, Level Two is involved with validation of models using field experiments, and Level Three is concerned with sensitivity and uncertainty analysis. The need for the HYDROCOIN project emerged from an earlier international study for the intercomparison of computer codes for radionuclide transport (INTRACOIN). The HYDROCOIN project began in May 1984 with a group of fourteen organizations from eleven countries participating; currently twenty organizations are involved. Five teams from DOE's Office of Civilian Radioactive Waste Management (OCRWM) are participating in the HYDROCOIN project, and this document presents the results of a review of this participation and an analysis of the benefits of OCRWM participation in the first 2 years (i.e., through May 1986) of the 3-year HYDROCOIN project. Efforts on the seven Level One cases are nearly complete. Level Two problems have been formulated and are in final draft form, and Level Three problems have been identified and are in first draft form. This report details the motivation, need, and benefits from HYDROCOIN through a chronological synopsis of the project's progress to date, brief description and intercomparison of preliminary Level One results prepared by OCRWM participants, and discussion of OCRWM contributions and plans for HYDROCOIN Level Two and Three efforts.

16921 **(SAND—87-7001C) A modeling study of the Culebra dolomite.** Haug, A. (Sandia National Labs., Albuquerque, NM (USA); Intera Technologies, Inc., Austin, TX (USA)). 1987. Contract AC04-76DP00789. 27p. (CONF-870252—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005064.

From Solving ground water problems with models conference; Denver, CO, USA (10 Feb 1987).

A modeling study has been performed as part of the regional hydrologic characterization of the Waste Isolation Pilot Plant (WIPP) site in New Mexico. The study resulted in an estimation of the transmissivity distribution, the hydraulic potentials, the flow field, and the fluid densities in the Culebra Dolomite Member of the Rustler Formation at the WIPP site. The work performed consisted of modeling the hydrogeology in the Culebra using two different approaches: steady-state modeling of the best estimate of the undisturbed situation, and transient modeling of the hydrogeologic conditions resulting from excavating three shafts at the center of the WIPP site as well as from various well tests. The three-dimensional finite-difference code SWIFT II with variable fluid density formulation was employed. The size of the model area was 12.24 km x 11.70 km. The boundary conditions (prescribed pressures and fluid densities) were estimated using the hydraulic head and fluid density data obtained from 40 wells at the WIPP site. The initial spatial transmissivity distribution in the Culebra dolomite was estimated using kriging techniques. The steady-state model was cali-

brated against the observed formation pressures and fluid densities. The calibration parameters were the transmissivities and the boundary conditions. The transmissivities were modified during the calibration process using kriging techniques, thus maintaining the statistical properties of the observed transmissivity data. The calibrated steady-state model was used as initial conditions for simulating transient processes in the Culebra at the WIPP site. The examples presented include the shaft history beginning in 1981 and a long-term pumping test (denoted the H-3 multipad pumping test) conducted in 1985.

16922 **Structure and timing of the last deglaciation: oxygen-isotope evidence.** Mix, A.C.; Ruddiman, W.F. (Columbia Univ., Palisades, NY). *Quaternary Science Reviews;* 4: 59-108(1985). Contract AC02-79EV10097.

Foraminiferal oxygen-isotope data from 24 tropical Atlantic sediment cores, constrained by 77 ^{14}C dates, are stacked to form a composite record of isotopic Termination 1. This record indicates that most of the isotopic transition at the end of the last ice age occurred between 14 ka BP and 6 ka BP. Minor isotopic expression of deglaciation is permitted as early as 16 ka BP, but the most rapid rate of change occurred between 14 ka BP and 12 ka BP. Three steps of maximum change are present. Although they are close to the statistical limits of detection in the composite record, the clear presence of the steps in individual records suggests that they are real. They estimate their timing at 14-12 ka BP (termination 1-a), 10-9 ka BP (Termination 1-b), and 8-6 ka BP (Termination 1-c). Centering of the termination near 11 ka BP is consistent with the Milankovitch hypothesis that high summer insolation caused deglaciation. In detail, however, maximum rates of change prior to the 11 ka BP insolation extreme, and the inferred steps require additional mechanisms controlling the tempo of glacial-interglacial climate change. Steps equivalent to those in $\delta^{18}O$ have not been detected in ice-margin retreat data. Steps in the isotopic transition, if real, may record thinning of the ice sheets not accompanied by loss of area. Alternation between near-equilibrium and near-stagnant ice-sheet profiles during deglaciation is hypothesized, perhaps due to calving and unstable down-draw of the ice sheets followed by partial re-equilibration. Significant problems remain. The effects of temperature on the isotope record are only partially constrained. Presently available data allow only semi-quantitative intercalibration of ice volume, sea level, and isotopic estimates of glaciation.

5802 Geophysics

16923 **(EGG-PHY—7223) Reactivity analyses of Schlumberger samples.** Harker, Y.D.; Napper, P.R.; Roybal, G.S.; Scott, D.L. (EG and G Idaho, Inc., Idaho Falls (USA)). Apr 1986. Contract AC07-76ID01570. 20p. NTIS, PC A02/MF A01. File Number DE87004530.

The reactivity method has been used to measure the thermal absorption cross section on small samples (50cc or less). Through a cooperative program with SANDIA Laboratory (J.M. Harris, P.J. McDaniel, P. Lysne) this method has been demonstrated to have the ability to measure cross sections down to a few capture units (depending on sample size). The major thrust for this effort was in 1981-1982 which resulted in the determination of a set of sensitivity coefficients which relates the reactivity measurements taken in six positions of the Advanced Reactivity Measurement Facility (ARMF) to the thermal absorption cross section. Since this method does not require chemical or isotopic analyses of the contents it is a direct method for measuring the effective absorption cross section. The method has been used to analyze geological samples taken from oil exploration field activities and from laboratory calibration activities. The Schlumberger Well Services samples identified in this report are from the new calibration facility for Schlumberger located near Houston, Texas. 1 ref.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 16928

16924 **(BMI/ONWI—630) Preliminary rock mechanics laboratory: Investigation plan.** Oschman, K.P.; Hummeldorf, R.G.; Hume, H.R.; Karakouzian, M.; Vakili, J.E. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Jan 1987. Contract AC02-83CH10140. 98p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87005580.

This document presents the rationale for rock mechanics laboratory testing (including the supporting analysis and numerical modeling) planned for the site characterization of a nuclear waste repository in salt. This plan first identifies what information is required for regulatory and design purposes, and then presents the rationale for the testing that satisfies the required information needs. A preliminary estimate of the minimum sampling requirements for rock laboratory testing during site characterization is also presented. Periodic revision of this document is planned.

16925 **(BMI/ONWI—631) Laboratory investigation of crushed salt consolidation and fracture healing.** (IT Corp., Albuquerque, NM (USA); Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Jan 1987. Contract AC02-83CH10140. 202p. NTIS MF A01; 2; GPO Dep. File Number DE87005487.

A laboratory test program was conducted to investigate the consolidation behavior of crushed salt and fracture healing in natural and artificial salt. Crushed salt is proposed for use as backfill in a nuclear waste repository in salt. Artificial block salt is proposed for use in sealing a repository. Four consolidation tests were conducted in a hydrostatic pressure vessel at a maximum pressure of 2500 psi (17.2 MPa) and at room temperature. Three 1-month tests were conducted on salt obtained from the Waste Isolation Pilot Plant and one 2-month test was conducted on salt from Avery Island. Permeability was obtained using argon and either a steady-state or transient method. Initial porosities ranged from 0.26 to 0.36 and initial permeabilities from 2000 to 50,000 md. Final porosities and permeabilities ranged from 0.05 to 0.19 and from $<10^{-5}$ md to 110 md, respectively. The lowest final porosity (0.05) and permeability ($<10^{-5}$ md) were obtained in a 1-month test in which 2.3% moisture was added to the salt at the beginning of the test. The consolidation rate was much more rapid than in any of the dry salt tests. The fracture healing program included 20 permeability tests conducted on fractured and unfractured samples. The tests were conducted in a Hoek cell at hydrostatic pressures up to 3000 psi (20.6 MPa) with durations up to 8 days. For the natural rock salt tested, permeability was strongly dependent on confining pressure and time. The effect of confining pressure was much weaker in the artificial salt. In most cases the combined effects of time and pressure were to reduce the permeability of fractured samples to the same order of magnitude (or less) as the permeability measured prior to fracturing.

16926 **Experimental studies of elastic-wave propagation in a columnar-jointed rock mass.** King, M.S.; Myer, L.R.; Rezowalli, J.J. (Earth Science Div., Lawrence Berkeley Lab., Berkeley, CA). *Geophysical Prospecting;* 34: No. 8, 1185-1199(Dec 1986).

Results are presented of a series of cross-hole acoustic measurements made between four horizontal boreholes drilled from a near-surface underground opening situated in a basaltic rock mass. The objectives of the programs were to assess the extent of blast damage around the opening, and to evaluate the rock mass characteristics and their spatial variation around the opening. The acoustic velocity and attenuation data are indicative of an anisotropic, jointed rock mass, with a greater intensity of jointing along travel paths in the horizontal than the vertical direction. Low acoustic P- and S-velocities are indicative of blast damage and of zones of intense jointing or fracturing. In this case blast damage extends to approximately 1.5 m from the face. Attenuation data appear to be less sensitive in distinguishing between the blast-damaged zone and intense vertical jointing and fracturing in the virgin rock mass. Taken together with field data, laboratory measurements of P- and S-wave

velocities on intact core samples suggest that the rock mass is probably water saturated.

16927 **Direct measurement of the enthalpy of fusion of diopside.** Ziegler, D.; Navrotsky, A. (Princeton Univ., NJ). *Geochimica et Cosmochimica Acta;* **50**: No. 11, 2461-2466(Nov 1986). Contract FG02-85ER13437.

Crystalline diopside, $CaMgSi_2O_6$, was dropped directly into a Setaram HT1500 calorimeter operating at high temperature. At $1575 < T < 1624$ K, the heat content of the crystals was in excellent agreement with previously published results. Above 1634 K, a rise in the enthalpy was seen, supporting the incongruent melting reported by Kushiro. The total enthalpy of fusion at 1665 K, the nominal melting point, is 138.5 kJ/mol, in excellent agreement with measurements which used a cycle that involves dropping the liquid to form a glass and measuring heats of solution of glass and crystals. The heat content of a glassy diopside starting material was also measured. Because the calorimetric experiment lasts only about 8 minutes, these measurements could be extended into the supercooled liquid range (to 1170 K) before the onset of rapid crystallization. A change in slope in the measured heat contents gives a glass transition temperature of 9333 K, about 70 K lower than that reported by other methods. A linear fit of all the data above T/sub g/ (supercooled liquid at 970 to 1170 K, stable liquid at 1668 to 1766 K) gives an average heat capacity for the liquid of 332.8 J/mol/ x K, comparable to the value of 334.6 J/mol x K reported by Richet and Bottinga.

5804 Geochemistry

REFER ALSO TO CITATION(S) 15350, 16709, 16746, 16751, 16752, 16753, 16784, 16785, 16786, 16788, 16790, 16792

16928 **Dependence of albite dissolution kinetics on pH and time at 25°C and 70°C.** Knauss, K.G.; Wolery, T.J. (Lawrence Livermore National Lab., CA). *Geochimica et Cosmochimica Acta;* **50**: No. 11, 2481-2497(Nov 1986). Contract W-7405-ENG-48.

The dissolution rate of albite has been measured as a function of pH and time at 25°C and 70°C in a single-pass flow-through leaching apparatus. Run times extended to 50 days in each experiment. Limited data were obtained at 25°C in the pH range 4-10. More extensive data were obtained at 70°C over the pH range 1.39-11.75. Dissolution rates were defined by release of Si, and in some cases also by Al and Na releases. Speciation-solubility calculations indicate the solutions were well undersaturated for all the likely possible secondary minerals. The fluid was maintained far from equilibrium with albite in all runs. Analysis of the data shows a general consistency with the transition state theory model of Helgeson et al. Feldspars leached at low and high pH at 70°C showed extensive development of prismatic etch pits demonstrating a surface reaction-controlled dissolution process.

16929 **Arsenic distributions in porewaters and sediments of Puget Sound, Lake Washington, the Washington coast and Saanich Inlet, B.C.** Peterson, M.L.; Carpenter, R. (Univ. of Washington, Seattle). *Geochimica et Cosmochimica Acta;* **50**: No. 3, 353-369(Mar 1986). Contract AT06-71EV70024.

Solid phase As, Mn, Al, and excess ^{210}Pb and dissolved total As, As^{+3} As^{+5}, Mn^{+2}, Fe^{+2}, PO_4^{-3}, NH_4^+, and H_2S profiles in 12 cores from Puget Sound, Lake Washington, the Washington coast, and Saanich Inlet, B.C., are presented. Typically, strong correlations between solid phase As and Mn concentration maxima in surficial sediments are a result of intense As scavenging in the overlying waters by Mn or Fe-rich phases, or solid phase As dissolution at depth followed by upward diffusion and co-precipitation with Mn or Fe oxides at or near the sediment-water interface. Atypically, anthropogenic inputs cause high sedimentary As concentrations without accompanying high Mn levels. Sedimentary As fluxes are an order of magnitude greater in Puget Sound and Lake Washington than off the Washington coast and in Saanich Inlet. Porewater total As concentration profiles exhibit sub-surface maxima with magnitudes 10-60 times greater than in overlying bottom waters. Porewater maxima in marine environments are proportional to associated solid phase As concentrations. These maxima consistently occur within +/- 1.0 cm of the bottom of the ^{210}Pb-derived surface mixed layer, suggesting solid phase As release to porewater in response to a redox gradient across this mixing boundary. Dissolved As behavior beneath these maxima indicates As removal to solid phases in marine, but not lacustrine porewaters. Porewater As^{+3}/As^{+5} ratios are < 1.0 for Washington coastal environments and usually between 1.0-4.0 for Puget Sound and Lake Washington. As^{+5} is below the detection limit in porewaters of Saanich Inlet when the overlying bottom water is anoxic, but As^{+3}/As^{+5} ratios as low as 2.8 exist in near surface porewater under oxic bottom water conditions.

16930 **Identification of the physical and chemical characteristics of volcanic hazards.** Olsen, K.B.; Fruchter, J.S. (Battelle Pacific Northwest Labs., Richland, WA). *American Journal of Public Health, Supplement;* **76**: No. 3, 45-50(Mar 1986).

Immediately after the May 18, 1980 eruption of Mount St. Helens, the public health and laboratory science communities were required to assess the likely nature and toxicity of the volcanic products. This included assessing the following volcanic products: the emissions of volcanic gases (SO_2) and H_2S), volatile organics (polynuclear aromatic and halogenated hydrocarbons), toxic inorganics (arsenic, mercury, HF, and HCl), radon gas and short-lived radiation emitted (alpha and gamma) during the decay of radon daughters, and respirable particulates (fibrous materials and free crystalline silica). The intent of this article is to present the Mount St. Helens environmental sampling plan, discuss the numerous techniques available to the public health community to analyze volcanic emissions for toxic materials, and briefly outline the findings of the many analytical laboratory studies published after the 1980 eruption of Mount St. Helens.

16931 **Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt.** Wright, D.P.; Navrotsky, A. (Arizona State Univ., Tempe). *Geochimica et Cosmochimica Acta;* **49**: No. 11, 2385-2393(Nov 1985).

Glasses and crystals of compositions $MgCaSi_2O_6$, $CoCaSi_2O_6$ and $NiCaSi_2O_6$ were studied by high temperature solution calorimetry, x-ray diffraction, and pycnometry. These data were combined with trace element distribution data to obtain values for ΔG^0, ΔH^0, ΔS^0, and ΔV^0 for M-Mg exchange reactions. Enthalpies of vitrification increase in the order Co, Mg, Ni as do volumes of vitrification and apparent melting points. The mixing of Co and Mg, Ni and Mg, and Co and Ni is almost ideal in crystals and glasses, with small negative heats of mixing and small volume changes. The exchange reactions $MgCaSi_2O_6$ (xl) + $MCaSi_2O_6$ (liq) = $MgCaSi_2O_6$ (liq) + $MCaSi_2O_6$ (xl) are exothermic for Ni and endothermic for Co. The volumes and entropies of the exchange reaction are small.

16932 **Distributions of dissolved calcium and alkalinity in the Weddell Sea in winter.** Chen, C.T.A. (Oregon State Univ., Corvallis). *Antarctic Journal of the United States;* 136-137(1983).

In the late austral winter of 1981, from 9 October to 25 November, as part of the US-USSR Weddell Polynya Expedition the authors measured dissolved calcium and titration alkalinity (TA) in the Weddell Sea. Their values were the first winter data collected in the Weddell Sea and probably represent the initial calcium and TA concentrations of the deep Pacific waters. With this information they can now calculate more accurately the in situ calcium carbonate ($CaCO_3$) dissolution rate in the Pacific.

5805 Oceanography

REFER ALSO TO CITATION(S) 16787, 16922

16933 (DOE/ER/60348—5) Continental shelf processes affecting the oceanography of the South Atlantic Bight: Progress report, June 1, 1986 to May 31, 1987. Atkinson, L.P. (Old Dominion Univ., Norfolk, VA (USA). Research Foundation). Jan 1987. Contract FG05-85ER60348. 52p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005303.

As part of a study of continental shelf processes affecting the oceanography of the South Atlantic Bight, data collected during the Spring 1985 SPREX field experiment was processed and analyzed. The goals of the analyses were to: (1) determine the distribution of temperature, salinity, nutrients, and humic fluorescence such that flow fields and distributions of variables could be related to wind forcing events; (2) determine the time change in nutrient concentration and salinity at selected current meter locations; and (3) evaluate the usefulness of tritium as a fresh water tracer in the nearshore region of the South Atlantic Bight. (ACR)

16934 (DOE/ER/60435—T2) Sediment transport characteristics of the nearshore zone between Hilton Head and Ossabaw Islands, Georgia as determined by heavy mineral analysis. Schmitter, R.D. (Georgia Univ., Athens (USA)). 1986. Contract FG09-86ER60435. 90p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87004385.

The objective was to understand sediment transport processes in the nearshore zone between Hilton Head and Ossabaw Islands along the coast of Georgia. The heavy mineral composition of the sediments was used to map the distribution of sediments from the Savannah and Ogeechee Rivers of Georgia, the Santee and Coosawatchie/Broad Rivers of South Carolina, and the adjacent continental shelf. (ACR)

64 PHYSICS I

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 16424, 16424, 17088, 17106, 17368, 17404, 17405

16935 (ATR—6(9558)-11) Contributions to the 18th International Cosmic Ray Conference. Blake, J.B.; Fennell, J.F.; Koga, R.; Katz, N.; Dearborn, D.S.P.; Margolis, S.H. (Aerospace Corp., El Segundo, CA (USA)). Mar 1986. 20p. NTIS, PC A02/MF A01.

Four papers presented at the 18th International Cosmic Ray Conference are compiled. Topic areas include: ultraheavy cosmic rays, secondary production of gamma rays in the Jovian magnetosphere, the stellar upper mass limit in an OB association, and a data processing unit for satellite- borne composition instrumentation.

16936 (ATR—6(9558)-11, pp vp) Ultraheavy cosmic rays: Propagation and selective acceleration. Margolis, S.H.; Blake, J.B. (Aerospace Corp., El Segundo, CA). Mar 1986. NTIS, PC A02/MF A01.

In Contributions to the 18th International Cosmic Ray Conference.

Results of calculations of ultraheavy cosmic ray propagation are examined in the light of recent observations and theoretical advances with the objective of distinguishing the effects of propagation from nucleosynthesis and preferential acceleration. The results presented here have been calculated by the method described in Margolis (1983), with elements from iron (Z = 26) to uranium (Z = 92) combined in a single calculation. The source abundances of Anders and Ebihara (1982) have been used as a reference composition. It is shown, in particular, that the relative abundances of Sr and Ba are substantially increased by using the modified ionization potential dependence (MIPD) compared with solar abundance and the first ionization potential dependence (FIPD) models. In contrast, Pb shows similar enhancements in both FIPD and MIPD models.

16937 (ATR—6(9558)-11, pp vp) Secondary production of gamma rays in the Jovian magnetosphere. Blake, J.B.; Margolis, S.H. (Washington Univ., St. Louis, MO). Mar 1986. NTIS, PC A02/MF A01.

In Contributions to the 18th International Cosmic Ray Conference.

Photons in the MeV and above energy range resulting from interactions of energetic protons and electrons in the Jovian magnetosphere with the Jovian satellite Amalthea are studied. The photon flux as a function of Jovian radii is found to be 0.2/sq R(J) per sq cm/sec, a relatively low value. If the magnetospheric configuration at Jupiter is similar to that of the Earth, a nearly radiation-free region may exist below the trapped particles, but sufficiently high for an observing satellite to orbit with a reasonable drag lifetime.

16938 (ATR—6(9558)-11, pp vp) Stellar upper mass limit in an OB association and implications for cosmic rays and cosmic abundances. Blake, J.B.; Dearborn, D.S.P. (Arizona Univ., Tucson). Mar 1986. NTIS, PC A02/MF A01.

In Contributions to the 18th International Cosmic Ray Conference.

Some implications are considered of the possibility that the collapse of the solar nebula was induced by the supernova of an extremely massive star or, at least, such a star was in the vicinity of the protosolar nebula prior to its collapse to form the solar system. A very large star in the vicinity of the protosolar nebula can contribute to the protosolar nebula in several ways which differ from a smaller (but still large) star: (1) the high mass-loss rate of a very large star implies the dispersion into the nearby interstellar medium of many solar masses of freshly synthesized material (a substantial dilution can occur before its contribution is masked); (2) a significant amount of Al-26 is synthesized and dispersed well before the subsequent supernova; (3) energy is available in the stellar wind for accelerating cosmic rays in sufficient quantities to heavily irradiate nearby material; (4) the absence of freshly synthesized Pu-244 (no resetting of the plutonium clock) can be understood in a natural way; and (5) a significant amount of Pd-107 can be dispersed into the interstellar medium during a WC stage.

16939 (ATR—6(9558)-11, pp vp) Versatile Data Processing Unit (DPU) for satellite-borne composition instrumentation. Blake, J.B.; Fennell, J.F.; Koga, R.; Katz, N. Mar 1986. NTIS, PC A02/MF A01.

In Contributions to the 18th International Cosmic Ray Conference.

A data processing unit (DPU) for use with a charge-composition experiment to be flown aboard the VIKING auroral research satellite is described. The design of this DPU is such that it can be readily adapted to a variety of cosmic-ray composition experiments.

16940 (CEA-CONF—8460) Heavy element compositions and energy spectra of galactic and solar cosmic rays. Engelmann, J.J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Apr 1986. 22p. (In French). (CONF-8604273—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750446.

From International spring school on space environment technology; Toulouse, France (14 Apr 1986).

Two components are apparent in the proton and heavy nuclei cosmic ray records; the galactic component, solar modulated in accordance with the 11 years cycle, and the solar component, consisting of bursts of particles spread in interplanetary medium and occuring at random, but preferentially during the period of solar maximum. Comparison of observed abundances of galactic cosmic rays and local galactic matter provides information on the sources of cosmic rays and on their journey in the galaxy. As regards the solar proton events, the observed abundances vary from one event to the other. It is however possible to draw a basic composition, which, while different from local galactic and solar photospheric composition, is very similar to that observed in the solar corona and in the galactic cosmic rays. Solar events have been parametrized in order to allow an evaluation of their effects: there are typical spectra for the ordinary and anomalously large events, and there is a "mean case" and "worst case" composition of a typical event.

16941 (CONF-8607112—1) **Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon].** Allamandola, L.J.; Tielens, A.G.G.M.; Barker, J.R. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center; Michigan Univ., Ann Arbor (USA). Dept. of Atmospheric and Oceanic Science). 1986. Contract FG02-85ER13442. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87003375.

From Interstellar processes conference; Jackson, WY, USA (1 Jul 1986).

The mid-infrared interstellar emission spectrum with features at 3050, 1610, 1300, 1150, and 885 cm^{-1} (3.28, 6.2, 7.7, 8.7 and 11.3 microns) is discussed in terms of the Polycyclic Aromatic Hydrocarbon (PAH) hypothesis. This hypothesis is based on the suggestive, but inconclusive comparison between the interstellar emission spectrum with the infrared absorption and Raman spectra of a few PAHs. The fundamental vibrations of PAHs and PAH-like species which determine the ir and Raman properties are discussed. Interstellar ir band emission is due to relaxation from highly vibrationally excited PAHs which have been excited by ultraviolet photons. The excitation/emission process is described in general and the ir fluorescence from one PAH, chrysene, is traced in detail. Generally, there is sufficient energy to populate several vibrational levels in each mode. Molecular vibrational potentials are anharmonic and emission from these higher levels will fall at lower frequencies and produce weak features to the red of the stronger fundamentals. This process is also described and can account for some spectroscopic details of the interstellar emission spectra previously unexplained. Analysis of the interstellar spectrum shows that PAHs containing between 20 and 30 carbon atoms are responsible for the emission. 43 refs., 11 figs.

16942 (EFI—788(15)-85) **Ultra-high energy gamma-rays as the carriers of cosmological information.** Agaronyan, F.A.; Atoyan, A.M. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700680.

A possibility to verify a number of cosmological hypotheses by searching the cutoffs in spectra of ultra-high energy gamma-rays from extragalactic sources is discussed. 24 refs.; 4 figs.

16943 (INIS-mf—10556-Vol.1, pp 129-132) **Convection-driven dynamos.** Soward, A.M. (Newcastle upon Tyne Univ., UK. School of Mathematics). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

In addition to the buoyancy forces driving the convection, the Lorentz and Coriolis forces play a dominant role in determining the nature of fluid motion in the Earth's core. Two geodynamo models distinguished by the assumed strength of magnetic field are discussed. In the weak field model the Lorentz force can be neglected at the lowest order, while in the strong field model the Lorentz and Coriolis forces are assumed to be comparable at the very outset. Current theoretical effort in the field is critically reviewed. (J.U.).

16944 (INIS-mf—10556-Vol.1) **Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1.** Janta, J.; Pantoflicek, J. (eds.). (Jednota Ceskoslovenskych Matematiku a Fyziku, Prague). 1984. 306p. (CONF-8408138—Vol.1). NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737.

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Volume 1 of the conference proceedings contains plenary lectures and papers of sessions on non-linear plasma astrophysics, neutrino physics and astrophysics, hard hadron collisions, positron-electron collisions, and atomic and molecular physics. (J.P.).

16945 (INIS-mf—10556-Vol.1, pp 150-155) **Magnetic reconnection in astrophysics.** Schindler, K. (Bochum Univ., Germany, F.R. Inst. fuer Theoretische Physik). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Magnetic reconnection has been invoked to explain important transport phenomena and the activity of space and astrophysical plasmas. Two major classes of reconnection are generally distinguished. If time dependence is not essential, steady state reconnection schemes may be applicable. The time-dependent reconnection may either be predominantly spontaneous or predominantly driven. A few aspects that are essential in current research in this field are mentioned and the general trend in favour of the time-dependent reconnection is emphasized. The key role of in-situ space probe measurements is accounted for. A satisfactory theoretical understanding of reconnection requires a deeper insight into collective dissipation processes. (J.U.).

16946 (INIS-mf—10556-Vol.1, pp 156-161) **Particle acceleration by turbulent plasmas.** Benz, A.O. (Eidgenoessische Technische Hochschule, Zurich, Switzerland). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Acceleration processes in stellar atmospheres seem to be very common. In solar flares at least two acceleration mechanisms can be observed. All of them are complex electromagnetic phenomena. Relevant observations of the past maximum of solar activity are reviewed. Macroscopic views today favor magnetic reconnection as the primary energy release mechanism. They do not tell us, however, how magnetic energy is converted into kinetic energy of particles. Electron bremsstrahlung observed in hard X-rays suggests that a considerable part of the energy is first showing up in 30 to 100 keV electrons. Evidence is presented for stochastic acceleration of electrons and ions by plasma turbulence in this first phase of flares. Theoretical work on a acceleration of electrons and ions by resonance interaction with stochastic turbulence is progressing. The turbulence may form in the primary flare energy release, e.g., by unstable currents. The requirement of high efficiency suggests that the unstable waves play a central role in the energy conversion process. Lower-hybrid waves driven cross-field drifting ions (or currents) are proposed. The diffusion equation has been solved and the results compared with observations. Some of this turbulence may be converted to radio emission at decimeter wavelengths. The consequences for flare models and the interpretation of solar radio bursts are discussed.

16947 (INIS-mf—10556-Vol.1, pp 186-187) **Self-consistent models of solar photospheric magnetic flux concentrations.** Deinzer, W.; Hensler, G.; Schuessler, M.; Weisshaar, E. (Goettingen Univ., Germany, F.R.; Muenchen Univ., Germany, F.R.; Kiepenheuer-Institut fuer Sonnenphysik, Freiburg, Germany, F.R.; Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Goettingen, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The structure was investigated of photospheric flux concentrations by numerical integration of the full nonlinear MHD equations. The results are summarized and a flux tube with a diameter of 500 km discussed in more detail.

16948 (INIS-mf—10556-Vol.1, pp 188-189) **Coronal heating by magnetic tearing turbulence.** Browning, P.K. (Saint Andrews Univ., UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The heating of solar corona by direct currents is investigated. The coronal field responds to slow photospheric motions by evolving through a series of equilibria which may be resistively unstable. The subsequent magnetic reconnection dissipates part of the magnetic energy. At evaluating the energy release the Taylor-Heuvaerts hypothesis is used. For a given footpoint motion the heating of an arcade is calculated. It is shown that linear velocity profiles

provide no heating, the energy transfer being more efficient in more strongly sheared arcades. (J.U.).

16949 (INIS-mf—10556-Vol.1, pp 192-193) **Magnetopause stability threshold for patchy reconnection.** Galeev, A.A.; Kuznetsova, M.M.; Zeleny, L.M. (AN SSSR, Moscow. Inst. Kosmicheskikh Issledovanij). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The magnetopause is considered as a transition layer in which the magnetic field vector rotates at a finite angle determined by the direction of the interplanetary magnetic field. The Vlasov kinetic approach is used to study the stability of magnetic surfaces within the layer. Magnetic surfaces can be destroyed by the growth and overlapping of magnetic islands, which can be considered to be a macroscopic but spatially localized magnetic field reconnection process. The thresholds and growth rates of such a reconnection are calculated. The preliminary results of theoretical consideration are discussed in relation with recent ISEE magnetopause measurements. (J.U.).

16950 (INIS-mf—10556-Vol.1, pp 16-24) **Compact galactic X-ray sources.** Paradijs van, J. (Amsterdam Univ., Netherlands). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Compact galactic X-ray sources are accreting compact objects in binary systems, accompanied by either a massive or low-mass star. A comparison of the observed properties of these massive and low-mass X-ray binaries, a short outline of their structural differences, and a summary of the constraints which can be put on neutron-star properties from X-ray observations of such systems are given.

16951 (INIS-mf—10556-Vol.1, pp 194-195) **Axisymmetric pulsar magnetosphere.** Mestel, L. (Sussex Univ., Brighton, UK. Astronomy Centre). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Progress towards the construction of a classical model of the pulsar magnetosphere is reported for the case where the angular velocity vector and the magnetic axis of the rigidly rotating neutron star are aligned. The trajectories of outstreaming electrons emanating with sub-relativistic speeds from each polar cap are calculated as well as the radiated power. Some particles at least return to the star with a high gamma value, thus pair production may be expected. (J.U.).

16952 (INIS-mf—10556-Vol.1, pp 199-211) **Aborigines of the nuclear desert.** Rujula, A. De. (European Organization for Nuclear Research, Geneva, Switzerland). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The chart of "stable nuclides" extends from hydrogen to Z — 98, A — 263. It contains another island of stability - neutron stars - in a narrow range around Z — 10/sup 56/, A — 10/sup 57/. In between lies a supposedly barren region encompassing more than 50 orders of magnitude. This desert may be populated by strange quark balls: stable single bags containing similar proportions of u, d and s quarks. These balls are candidates for the constituency of the "dark mass" in galaxies and in the Universe. Seven ways are described to search for these possible inhabitants of the nuclear desert.

16953 (INIS-mf—10556-Vol.1, pp 223-228) **Neutrino masses and galaxy formation.** Rees, M.J. (Cambridge Univ., UK. Inst. of Astronomy). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The issue of "hidden mass" is crucial to models of galaxy formation, and also to the question of whether the Universe can have the so called "critical density". If one species of (stable) neutrino had a mass of 10-100 eV, it could in principle provide such mass; however, the properties of galaxy clusters predicted by neutrino-dominated cosmogonic schemes may not be compatible with what is observed. The physical ideas involved in these schemes are outlined and compared with other ideas about what the "hidden mass" consists of.

16954 (INIS-mf—10556-Vol.1, pp 246) **Astrophysics and grand- and superunification.** Roncadelli, M. (Pavia Univ., Italy. Ist. di Fisica Nucleare). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

16955 (INIS-mf—10556-Vol.1, pp 247-256) **Thermodynamics of the Universe.** Marx, G. (Eoetvoes Lorand Tudomanyegyetem, Budapest, Hungary. Atomfizikai Tanszek). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Attention is focused on the initial period of the development of the Universe following the Big Bang. Questions are discussed related to the origins of matter, stars and galaxies, to the age of the Universe, to the time of its future existence, etc. (Z.J.).

16956 (INIS-mf—10556-Vol.1, pp 162-169) **Shock wave acceleration.** Voelk, H.J. (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Only an extremely efficient and ubiquitous mechanism might explain the energy sources and the power law spectrum of the galactic cosmic rays. The Fermi acceleration process associated with shock waves can meet such requirements. To illustrate this fact, particle acceleration in a diffuse shock is described in detail. The interaction of the interstellar high-energy particle component with a thermal gas is simple but strongly nonlinear. Some nonlinear aspects of the acceleration processes are treated in detail. Most effects described in the paper have been observed in interplanetary shocks. Moreover, the special process of shock acceleration might be able to replenish the high-energy particle component throughout the Universe. More detailed astronomical observations are needed to empirically check on this possibility. (J.U.).

16957 **(ITF—85-118-R) On the mass loss rate by the nuclei of planetary nebulae.** (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701325.

A type of dependence of the expansion velocity in planetary nebula (PN) on its radius that describes well the observed character of PN expansion is proposed. An analytical expression for mass loss rate by the nebula nucleus, that provides the observed expansion of nebula, is obtained in the model of fast and slow stellar winds. 14 refs.; 3 figs.

16958 **(ITF—86-29-R) UBVRI-photometry of the antiflare stars V586 Ori and IU Ori.** Koval'chuk, G.U. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700760.

The results of photoelectric UBVRI-observations of the antiflare stars V586 Ori carried in 1979-1983 are presented. A random deep weakening up to 2/sup m/(V) are the main process of variability. The decrease of variable star brightness is interpreted under the assumption that a global weakening of brightness is due to the appearance in a close proximity to variable stars of the absorbing matter clouds. 57 refs.; 9 figs.

16959 (JINR—R-2-85-667, pp 19-28) **Parametric transformation of weak gravitational wave into electromagnetic one in a three-level system.** Tagirov, Eh.A. 1985. (In Russian). NTIS (US Sales Only), PC A08/MF A01. File Number DE87780075. (CONF-8506332—).

From Conference on the history of particle physics; Dubna, USSR (25 Jun 1985).

A model of resonance parametric transformation of a gravitational wave to electromagnetic one is considered. Two plane monochromatic waves: a strong electromagnetic and weak gravitational - interacting in a medium generate at difference and sum frequencies an electromagnetic wave in a direction determined with the condition of spatial wave synchronism. Rarefied cold gas or beam of elementary emitters ("molecules") serve as a medium model. Coefficients of parametric transformation have been determined.

16960 (KFKI—1986-23/C) **Icy-glue model of cometary nuclei.** Gombosi, T.I.; Houpis, H.L.F. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). May 1986. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700817.

Since 1950 a number of models have been proposed to explain the observations of comets. For the most part the icy conglomerate model of Whipple was the standard. Based on the recent images made by VEGA and GIOTTO spacecrafts of comet Halley, a model of the nucleus is suggested that retains the advantages of the icy conglomerate formalism on a local level, while a new global framework is introduced. The model is discussed in terms of the mounting knowledge of comets, the creation of the nucleus in the cosmogenic sence, and expectations of future analysis of data and observations are presented. A new methodology for calculating the evolution and thermal profiles of the nucleus is also presented. 41 refs.

16961 (KFKI—1986-32/B) **Monopole abundance from first order GUT phase transition of the early Universe.** Bagoly, Zs.; Lukacs, B.; Paal, G. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700818.

Monopole annihilation and pair production are investigated in a first order GUT symmetry breaking phase transition without inflation. It is found that even with complete initial monopole suppression, some monopoles are inevitably produced during the transition. Accordingly, some constraints are obtained for the initial and equilibrium monopole densities in order to be compatible with the present observational limit even without inflation. 21 refs.; 3 figs.

16962 (KFKI—1986-41/C) **Cosmic ray fluctuations at rigidities 4 to 180 GV.** Benko, G.; Erdoes, G.; Stehlik, M.; Katz, M.E.; Nosov, S.F. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 11p. (CONF-8408212—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700821.

From 9. European cosmic ray symposium; Kosice, Czechoslovakia (20 Aug 1984).

The power spectral density of cosmic ray fluctuations observed at both underground and ground level during the years 1976-1980 was calculated. The spectral index is independent of the phase of solar cycle in the frequency range of 5 x 10/sup -7/ - 5 x 10/sup -5/ Hz and its value is equal to 2. The level of fluctuations shows a weak dependence on the rigidity (R) of the particles P—R/sup -2/3/. The obtained experimental results are in agreement with the theoretical predictions. 10 refs.; 4 figs.

16963 (LA-UR—86-3395) **Pulsations of white dwarf stars with thick hydrogen or helium surface layers.** Cox, A.N.; Starrfield, S.G.; Kidman, R.B.; Pesnell, W.D. (Los Alamos National Lab., NM (USA)). Jul 1986. Contract W-7405-ENG-36. 6p. (CONF-8607108—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87001954.

From IUA symposium no. 123; Aarhus, Denmark (7 Jul 1986).

In order to see if there could be agreement between results of stellar evolution theory and those of nonradial pulsation theory, calculations of white dwarf models have been made for hydrogen surface masses of 10^{-4} solar masses. Earlier results indicated that surface masses greater than 10^{-8} solar masses would not allow nonradial pulsations, even though all the driving and damping is in surface layers only 10^{-12} of the mass thick. It is shown that the surface mass of hydrogen in the pulsating white dwarfs (ZZ Ceti variables) can be any value as long as it is thick enough to contain the surface convection zone. 10 refs., 6 figs.

16964 (LA-UR—86-4115) **Nonlinear RR Lyrae models with time dependent convection.** Ostlie, D.A.; Cox, A.N. (Los Alamos National Lab., NM (USA); Weber State Coll., Ogden, UT (USA). Dept. of Physics). 11 Aug 1986. Contract W-7405-ENG-36. 5p. (CONF-8608130—9). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003721.

From Stellar pulsation conference; Los Alamos, NM, USA (11 Aug 1986).

Results of convective, nonlinear RR Lyrae models are presented. The standard mixing length theory has been used with time dependence being introduced through the convective velocity phase lag technique. Turbulent pressure and turbulent viscosity are also included. Results are compared with those of other time dependent convection theories. 9 refs., 2 figs.

16965 (LA-UR—86-4116) **Linear nonadiabatic pulsations of homogeneous ZAMS stars.** Cahn, J.H.; Cox, A.N.; Ostlie, D.A. (Los Alamos National Lab., NM (USA); Illinois Univ., Urbana (USA). Dept. of Astronomy; Weber State Coll., Ogden, UT (USA). Dept. of Physics). 11 Aug 1986. Contract W-7405-ENG-36. 5p. (CONF-8608130—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003722.

From Stellar pulsation conference; Los Alamos, NM, USA (11 Aug 1986).

Current uncertainty about the most massive observed stars has led to a reexamination of the most massive star that is stable against radial pulsation. The nuclear energy generation equations in the LNA linear, nonadiabatic code have been considerably improved, so that it is now appropriate to redo the study to determine the maximum mass of ZAMS star that will be stable against pulsation. 12 refs., 2 figs., 2 tabs.

16966 (LA-UR—86-4331) **Observations of heavy energetic ions for upstream from comet Halley.** Sanderson, T.R.; Wenzel, K.P.; Daly, P.W.; Cowley, S.W.H.; Hynds, R.J.; Richardson, I.G.; Smith, E.J.; Bame, S.J.; Zwickl, R.D. (Los Alamos National Lab., NM (USA); European Space Research and Technology Centre, Noordwijk (Netherlands); Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (Germany, F.R.); Imperial Coll. of Science and Technology, London (UK); Jet Propulsion Lab., Pasadena, CA (USA)). 1986. Contract W-7405-ENG-36. 6p. (CONF-8610207—3). NTIS, PC A02. File Number DE87003752.

From 20. ESLAB symposium; Heidelberg, F.R. Germany (27 Oct 1986).

On March 25, 1986, the ICE spacecraft came within 28 x 10^3 km of the nucleus of comet Halley. For several days around this time, bursts of heavy ions were observed by the ICE energetic ion experiment. These bursts were observed only during periods when the solar wind velocity was considerably higher than its nominal value. We examine the characteristics of these ions, in particular their anisotropies. Using the well known formulae for transformation of distributions from the solar wind frame of reference to the spacecraft frame, we examine the angular distributions expected from either protons, or heavy ions from the water group, and show that the measurements are consistent with heavy ions, and not with protons. We discuss other sources of heavy ions and conclude that the most likely source of these ions is comet Halley. 9 refs., 5 figs.

16967 (LA-UR—87-38) **Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner.** Tsurutani, B.T.; Smith, E.J.; Thorne, R.M.; Gosling, J.T.; Matsumoto, H. (Los Alamos National Lab., NM (USA); Jet Propulsion Lab., Pasadena, CA (USA); California Univ., Los Angeles (USA). Dept. of Atmospheric Sciences; Kyoto Univ. (Japan)). 1986. Contract W-7405-ENG-36. 6p. (CONF-8610207—8). NTIS MF A01; 2; GPO Dep. File Number DE87005123.

From 20. ESLAB symposium; Heidelberg, F.R. Germany (27 Oct 1986).

We extend the previous studies of intense hydromagnetic waves at Giacobini-Zinner to investigate the mode and direction of wave propagation. Simultaneous high-resolution measurements of electron density fluctuations demonstrate that the long period (~100 s) waves are propagating in the magnetosonic mode. Principal axis analyses of the long period waves and accompanying partial rotations show that the sum of the wave phase rotations is 360°C, indicating that both are parts of the same wave oscillation. From the time sequence of the steepened waveforms observed by ICE, we demonstrate that the waves must propagate towards the sun with C/sub ph/ < V/sub sw/. All available observations are consistent with wave generation by the resonant ion ring or ion beam instability which predicts right-hand polarized waves propagating in the ion beam (solar) direction. The large amplitudes Δ polarized B/absolute value of B~0(1) and small scale sizes (rotational discontinuities) of the cometary waves suggest that rapid pitch-angle scattering and energy transfer with energetic ions should occur. Since the waves are highly compressive, Δ absolute value of B/absolute value of B = 0(0.5), one can also anticipate first-order Fermi acceleration. 15 refs., 6 figs.

16968 (N—87-12406) **Variability studies of 3C 371. Final report, 1 April 1985-30 September 1986.** Worrall, D.M. (Smithsonian Astrophysical Observatory, Cambridge, MA (USA)). Oct 1986. 4p. (NASA-CR—179772; NAS—1.26:179772). NTIS, PC A02/MF A01.

The compact extragalactic radio source, 3C 371, was observed with the x-ray detectors of the EXOSAT satellite for 19.5 hours in 2 observing periods separated by 18 days. This resulted in the discovery of x-ray variability of the source on time scales between 8 hours and about 25 minutes and the confirmation of earlier reports of variability on longer time scales. The short time scale variability agrees remarkably well with earlier predictions based on fitting multifrequency data from the source to a relativistically beamed inhomogeneous synchrotron self-Compton (SSC) jet model. This SSC model is frequently applied to BL Lac objects and related sources, such as 3C 371. However, the number of free parameters in model fits tends to be large, and so independent support such as from this work is important. The x-ray spectral results for 3C 371 also may provide qualitative support for the SSC model in that the spectrum probably consists of two components, with the steeper one at low photon energies. In terms of the model, the low-energy spectrum would be dominated by synchrotron emission extending down to radio energies, whereas the higher energy x-rays would be dominated by Compton radiation.

16969 (N—87-12407) **Reports of planetary astronomy, 1985.** (National Aeronautics and Space Administration, Washington, DC (USA)). Sep 1986. 217p. (NASA-TM—89189; NAS—1.15:89189). NTIS, PC A10/MF A01.

This is a compilation of abstracts of reports from Principal Investigators funded through NASA's Planetary Astronomy Program, Office of Space Science and Applications. The purpose is to provide a document which succinctly summarizes work conducted in this program for 1985. Each report contains a brief statement on the strategy of investigation and lists significant accomplishments within the area of the author's funded grant or contract, plans for future work, and publications.

16970 (N—87-12407, pp vp) **Research in planetary astronomy.** Mccord, T.B. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The composition, structure and processes operating on the surfaces of solar system objects were determined using the Mauna Kea observing facilities and modern instrumentation. Reflectance spectroscopy and multispectral imaging in the 0.3 to 5.0 micrometers spectral region are the major techniques used. Major focus was in qualifying and using the new imaging spectrometer and the 2-D IR detectors for spectroscopy and imaging. The major observational program emphasis was on preparing for the next Mars opposition, and searching for compositional units in the lunar highlands.

16971 (N—87-12407, pp vp) **Advanced infrared astronomy.** Mumma, M.J.; Deming, D.; Espenak, F.; Kostiuk, T. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The CO_2 laser heterodyne spectrometer was used at the 3-m IRTF on Mauna Kea to make measurements of Mars during the 1984 opposition. Analysis of the observations of the mesospheric non-thermal emission demonstrated the existence of a warming of the Mars polar mesosphere, similar to the seasonal effects which are well known to occur at the Earth's mesopause. A search for CO_2 and NH_3 on Comet Halley was done with the new Kitt Peak system as well as with the IRTF heterodyne system. A Lamb-dip absorption cell was designed and constructed. Its use will allow extreme frequency stabilization of the laser local oscillator, which will greatly facilitate measurements of winds and dynamical phenomena. The Lamb-dip cell was used at Kitt Peak to study zonal and meridional winds in the atmosphere of Venus. Water vapor was detected in Comet Halley using Fourier transform spectrometer. The 2.65 micrometer upsilon sub 3 band was seen in emission, confirming non-thermal-equilibrium excitation models for comets. A study was made of the variability of Jovian ethane emission. The average volume mixing ratio of ethane in the Jovian stratosphere was found to be 3x10 to the -6 power, with the greatest variability seen in the auroral regions.

16972 (N—87-12407, pp vp) **Search for volatiles in the surface of icy satellites.** Brown, R.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

It is proposed to measure the reflectance spectra of the icy satellites of Jupiter, Saturn and Uranus in the spectral region 1.8 to 2.4 micrometers. These observations use the new Cooled Grating Array Spectrometer using a 32-element InSb photodiode array detector and produce spectra of higher resolution and precision than any data yet obtained; the ultimate scientific objective is to search for the signatures of methane clathrate, ammonium hydroxide or carbon monoxide clathrate (compounds predicted to exist on icy surfaces in the outer solar system by several theories of formation of these bodies) in the region of the spectrum where water ice has a relative maximum in reflectance. At the very least, these data will allow upper limits to be placed on the amount of these chemical species that can be present. The specific targets is Europa, Ganymede, Enceladus, Ariel and Titania, bodies that have the highest probability of having some or all of these volatiles on their surface according to current formation models.

16973 (N—87-12407, pp vp) **Theoretical and observational planetary physics.** Caldwell, J. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

This program supports NASA's deep space exploration missions, particularly those to the outer Solar System, and also NASA's Earth-orbital astronomy missions, using ground-based observations, primarily with the NASA IRTF at Mauna Kea, Hawaii, and also with such instruments as the Kitt Peak 4 meter Mayall telescope and the NRAO VLA facility in Socorro, New Mexico. An important component of the program is the physical interpretation of the observations. There were two major scientific discoveries resulting from 8 micrometer observations of Jupiter. The first is that at that wavelength there are two spots, one near each magnetic pole, which are typically the brightest and therefore warmest places on the planet. The effect is clearly due to precipitating high energy magnetospheric particles. A second ground-based discovery is that in 1985, Jupiter exhibited low latitude (+ or - 18 deg.) stratospheric wave structure.

16974 (N—87-12407, pp vp) **Portable high speed photometry systems for observing occultations.** Elliot, J.L.; Dunham, E.W. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Ring orbit studies for Uranus have been particularly fruitful because of the ability, through occultations, to obtain data of high spatial resolution at the rate of 1 to 2 times per year. The occultation program at M.I.T. involves: (1) identifying the scientific questions that can be answered by occultation events, (2) predicting the zone of visibility for the useful events, (3) maintaining and improving a set of portable high-speed photometric systems, (4) obtaining the observations, and (5) reducing the data and interpreting the results. Two stellar occultations by Uranus occurred in May 1985, and were observed with a network of large telescopes that encompassed the Northern and Southern Hemispheres. Portable quartz-oscillator time standards were used at all observatories, and were calibrated before and after each event. Observations obtained form Cerro Tololo and McDonald Observatories of the 4 May and 24 May 1985 occultations by the Uranian rings clearly show a companion to the delta ring on both the immersion and emersion traces. The occultation by Ceres that occurred on 12 November 1984 was observed. Preliminary results give a mean diameter of 933 + or - 10 km, which implies a geometric albedo, Pv = 0.07 + or - 0.01 and a density 2.7 + or - 0.3 gm cu/cm. Hence Ceres is likely composed of silicate material throughout.

16975 (N—87-12407, pp vp) **High-resolution imaging of solar system objects.** Goldberg, B.A. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

A very extensive Io sodium imaging program beginning with the first images of the cloud and culminating in comprehensive characterization of the cloud's appearance and behavior as a function of both time and Io's orbital position now forms the basis for a collaborative modeling analysis and a continued observational study with emphasis on understanding how the cloud's behavior is diagnostic of spatial and temporal variations in the physical conditions of the inner Jovian magnetosphere. The sodium cloud was found to have a variety of systematic variations, a pronounced east-west orbital asymmetry, and temporal changes which could be diagnostic of time changes in both Io and its plasma environment. New comet imaging programs initiated at the 3.6-meter Canada-France-Hawaii Telescope draw upon both ultra high time resolution and high spatial resolution imaging capabilities. Seven observing runs between Dec. 1984 and May 1986 were devoted to observing Halley, Giacobini-Zinner, and several other comets. Among these observations were the first images of Halley through IHW filters, and images of Giacobini-Zinner during the ICE encounter which have been directly correlated with ICE magnetic field measurements.

16976 (N—87-12407, pp vp) **Research in planetary astronomy and operation of the 2.2-meter telescope.** Hall, D.N.B.; Cruikshank, D.P.; Morrison, D.; Sinton, W.M. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The turn-around in the secular change in brightness of Pluto was detected, the planet is now beginning to brighten. The spectral signature was found of an ammonia bearing compound in the surface ices of Europa. Specific Io volcanic hotspots were detected from infrared photometry of the mutual events of the Jovian satellites. The polarized emission from the volcanic hotspots on Io was discovered and the locations of those hotspots were determined. The orbit of Charon was refined from speckle observations of the Pluto-Charon system. The spectral properties of liquid nitrogen-methane mixtures with reference to the infrared spectrum of Triton were studied. Major progress was made in modeling asteroid light-curves from a modern theory of photometric properties of the asteroid surfaces. Several additional olivine-rich asteroids from near-infrared spectrophotometry were discovered. Important photometric, spectroscopic, narrow-band imaging data on Comet P/Halley was acquired, along with Schmidt photographs of Comet P/Halley and its tail.

16977 (N—87-12407, pp vp) **Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers.** Jennings, D.E.; Kunde, V.G.; Hanel, R.A.; Maguire, W.C.; Lamb, G.M. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

High resolution infrared spectra of planets from ground-based observatories were analyzed and instrumentation to improve sensitivity was developed. A cryogenic postdisperser (a narrow bandpass spectral filter) for use with Fourier transform spectrometers (FTS's) at facility observatories was constructed. This instrument has improved the sensitivity of FTS observations at 8 to 20 microns by about an order of magnitude. Spectra of Jupiter, Saturn and Comet Halley were obtained using the postdisperser with FTS facilities at the Kitt Peak 4-meter and McMath telescopes. Spectral resolution as high as 0.01/cm was achieved.

16978 (N—87-12407, pp vp) **Infrared observations of outer planet satellites.** Johnson, T.V. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Infrared observations were made of the outer planet satellites. These data provide vital information about the thermophysical properties of satellite surfaces, including internal heat sources for Io. Observations include both broad and narrow band measurements in the 2 to 20 micrometer spectral range. Types of observation and target priority were determined to make maximum use of existing data from Voyager and other missions, on-going and planned missions such as Galileo, were supported and techniques and data for planning new missions and instrumentation were developed.

16979 (N—87-12407, pp vp) **Planetary submillimeter spectroscopy.** Klein, M.J. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

A comprehensive observational strategy was developed for the detection and measurement of molecular lines in the millimeter and submillimeter spectra of planetary atmospheres and comets. A sound observational strategy and the associated analytical capability to begin observations from the Caltech Submm Observatory (CSO) on Mauna Kea in FY 87-88. Comet Halley was observed from the NASA-KAO with the dual-frequency (0.8 and 1.6 mm) receiver and conducted a search for NH_3 with the DSN 64 m antenna.

16980 (N—87-12407, pp vp) **Infrared spectroscopy of Jupiter and Saturn.** Knacke, R.F. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The origin of carbon monoxide has been a puzzle for some time, and it has become apparent that CO serves as a tracer of disequilibrium processes in the Jovian atmosphere. High resolution spectra with a Fabry-Perot spectrometer was obtained. From a detailed synthetic spectral analysis of the CO line profiles, it was established that the CO is located in the troposphere of Jupiter. It must therefore be a product of convection upward from hotter levels in the deep atmosphere, and is not a product of infall of material from above the stratosphere. Six lines of CO in Saturn was detected, a surprising result because disequilibrium models predicted that the CO mixing ratio would be too low to be observable if upward convection is the dominant mechanism. Therefore several possibilities for the origin of the CO now exist, none completely satisfactory at this time.

16981 (N—87-12407, pp vp) **Outer planet studies.** Lutz, B.L.; Lockwood, G.W. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Spectrophotometric observation were completed of Titan and determinations of its geometric and bond albedos and completion of like observations of Uranus, pre-Voyager encounter. CH_3D was studied in the spectrum of Uranus and a determination of the CH_3D/CH_4 mixing ratio in its atmosphere. The observations needed for a direct calibration of the Sun against Vega was completed. The study was continued of CH_3D in the spectra of Saturn

and Titan. High resolution observations of O I, C2 and C-12 C-13 in the coma of P/Halley were also studied.

16982 (N—87-12407, pp vp) **Modeling and investigative studies of Jovian low frequency emissions.** Menietti, J.D.; Green, J.L.; Six, N.F.; Gulkis, S. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The Voyager data in a newly produced noise-reduced and recalibrated format has been received. New color spectrograms were developed on high resolution color terminals which display this data. The production of these new spectrograms utilizing the new format data is quite important, because it eliminates a serious problem of noise contamination and miscalibration in the old data set. In addition, a new Jovian plasma model was introduced, which includes the Io torus and accounts for 7 ionic species. The new plasma model is important in the ray tracing of hectometric (HOM) and kilometric (KOM) radiation which may be influenced by the Io torus.

16983 (N—87-12407, pp vp) **Submillimeter and millimeter observations of solar system objects.** Muhleman, D.O. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The millimeter wavelength 3-element array at OVRO was used to observe Halley's comet in carbon monoxide (negative result) and to set an upper limit from continuum flux of 15 km on the size of the nucleus, assumed to be a black body. The Saturn system was observed with the array and ring brightness temperatures at a wavelength of 2.7 mm were obtained. A B-ring temperature of 30 K was compared to the results at lambda = 2 cm of about 7 K indicates the measurement of true emission from the ring particles at mm-wavelengths. Brightness temperatures of Titan, Neptune, Uranus, Io, Europa, Ganymede, and Callisto were made, all tied to Mars. Accurate microwave spectra of all these objects from 3 mm to 6 cm were obtained.

16984 (N—87-12407, pp vp) **Lunar and planetary studies.** Muhleman, D.O. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Observations were made and analyzed for Uranus, Saturn, and Titan in the continuum at the VLA and some spectroscopy at OVRO. Accurate A, B, C rings brightness temperatures from Saturn are a basis of scattering theory calculations. Variations of 2 cm limb darkening with pole orientation were modeled and are shown to originate in the deep atmosphere.

16985 (N—87-12407, pp vp) **Infrared observations of planetary atmospheres.** Orton, G.S.; Baines, K.H.; Bergstralh, J.T. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Infrared data was obtained on planetary atmospheres which provides critical information on atmospheric structure, composition, and cloud properties in support of planetary missions such as Voyager and Galileo. Mapping of Jupiter and Saturn in thermal and reflected solar radiation is a high-priority monitoring and exploratory activity. Some of these images of Jupiter are shown. Radiation at 17.8 micrometer probes the upper tropospheric temperature structure where spatial structure bears a strong resemblance to visible and near-infrared reflected sunlight such as at 2.0 micrometer. At 7.8 micrometer, stratospheric temperatures appear to have a three-banded structure, enhancements near the magnetic poles and occasional transient features such as the equatorial filament near the right limb. Clouds or hazes are observed high in the stratosphere looking at wavelengths such as 2.2 micrometer, where gaseous opacity is very strong. Other maps examine cloud properties from thermal radiation not strongly influenced by gaseous opacity and the distribution of condensable gases, such as ammonia. Millimeter and submillimeter filtered radiometric observations were made of Jupiter, Uranus and Neptune via collaborative work. Radiometric observations of Uranus and Neptune at 21 and 32 micrometer were acquired and analyzed as well as grating array spectra in the ranges of 8 to 14 micrometer, 16 to 23 micrometer, and 18 to 32 micrometer. These showed evidence for C_2H_2 in the stratosphere of Uranus and C_2H_4 in the stratosphere of Neptune.

16986 (N—87-12407, pp vp) **Spectroscopic observations of the planets.** Owen, T. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The first phase of a program to determine D/H in the atmospheres of all of the major planets and Titan was completed. D/H on Titan and Uranus is significantly higher than on Jupiter and Saturn. Titan has the highest value, consistent with the possibility for hydrogen escape. These measurements were all made in terms of CH_3D/CH_4. They suggest that at least two reservoirs for deuterium exist in the outer solar system - a large one in hydrogen and a much smaller one in hydrogen-containing compounds that have not isotopically equilibrated with the hydrogen. This result also demonstrates that a large fraction of the carbon in the outer solar nebula was in the form of methane and it supports the nucleation model for the formation of the outer planets. Other studies included an investigation of the phosphine abundance over the Great Red Spot (GRS) of Jupiter, pre-Voyager determination of the amount of acetylene on Uranus, and the carbon isotope ratio in Halley's Comet. UV spectra of the GRS obtained with the IUE show no evidence of the enhancement of phosphine that would be expected if the red color of this object is caused by P4.

16987 (N—87-12407, pp vp) **Ground-based observations of the Jupiter plasma torus.** Scherb, F.; Rossler, F.L. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The intensity variation of (SIII) 9531 A emission from the hot plasma torus of Jupiter was measured using a scanning Fabry-Perot spectrometer. During the observational period, which covered 43 rotations of Jupiter, the (SIII) intensities showed a periodic variation consistent with a zone of enhanced emission approximately 90 deg in longitude, rotating with a period of 10.2 hours, or 2.8% longer than Jupiter's rotational period. Dessler developed a theoretical model of account for Jovian magnetospheric phenomena that differ in repetition period by 3%. In his model, periodic modulation of magnetospheric phenomena is controlled in part by the spin period of magnetic features below the surface of the planet. The differing observed periods are then due to differential rotation of the subsurface magnetic features at different latitudes. A consequence that follows from this concept of differential rotation of the internal planetary magnetic field is that not all the apparent subcorotational plasma flow in the torus is caused by plasma mass loading, as described by Hill and his associates. As a result, the mass loading required to produce the residual subcorotational flow is less than previously estimated.

16988 (N—87-12407, pp vp) **Continued program of planetary study at the University of Texas McDonald Observatory.** Smith, H.J.; Barker, E.S.; Cochran, W.D.; Trafton, L.M. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The beginning of eclipses of the Pluto-Charon system was detected. The onset of coma formation of P/Halley at 5.4 au was detected and evidence of sublimation at 4.8 au when CN emission was detected. Extensive spatial maps of the gas in the comae of comets Halley and Giacobini-Zinner were obtained in fall 1985. Halley was time variable, and Giacobini-Zinner was depleted in C_3 and C_2 relative to CN. Comet Kopff was shown to have a pre-perihelion brightness maximum of its gas, consistent with mantle development if the comet is a high obliquity object. New Haser model scale lengths for CN, C_2, and C_3 were determined using results from the Faint Comet Survey. Spectra of 12 asteroids in unusual orbits showed no evidence of any comet-like emission features. In particular, 3200 Phaethon (1983 TB) has no gas or dust coma, in spite of the similarity of its orbit with the Geminid meteor stream. Data were analyzed on Saturn's H_2 and CH_4 bands for the recent southern summer using a Tomasko-Doose type of haze distribution. This haze model fits the data moderately well, giving a CH_4 mixing ratio of (4.2 + or 0.4)x003. Simple functions were found to approx-

imate the collision-induced rotation-translation thermal opacity of H_2.

16989 (N—87-12407, pp vp) **Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions.** Smith, W.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Profiles were obtained for Uranus at a spectral resolution exceeding 450,000 for four quadrupole lines of H_2. A preliminary reduction of the line profile for the S3(0) transition is shown. Excellent data for the determination of the HD abundance for Uranus was obtained for the R5(0) and R5(1) transitions. An HD profile is shown. Preliminary analysis yields a value for the D/H ratio similar to that for Jupiter. Complete spatial coverage was obtained of Jupiter in spectrally resolved NH_3 lines for which the molecular parameters are known. The S4(1) and S3(1) H_2 features for Neptune were observed. While the S4(1) feature has the same equivalent width as for Uranus, the S3(1) feature is about 40% smaller. The Titan observations have confirmed the previous observations of the 6819 A CH_4 feature for Titan. The profile width is consistent with the surface pressure determined via Voyager observations.

16990 (N—87-12407, pp vp) **Research in planetary astronomy at Palomar Observatory.** Soifer, B.T.; Goldreich, P. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The goals of this program are three fold. The ring systems in the outer solar system were studied. New comets and asteroids in the solar system were surveyed. The volatile surface coverings of the primitive bodies in the outer solar system were studied via infrared spectroscopy.

16991 (N—87-12407, pp vp) **Analysis of Jovian decametric data: study of radio emission mechanisms.** Staelin, D.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Catalogues of approx. 200 decametric arcs and approx. 200 gaps between arcs were studied, in an effort to reconcile the data with predictions for the model wherein reflections of Io-induced currents each emit in a conical pattern and yield a distinct radio arc. The most recent interpretations of this data suggest that these Io-produced Alfven waves persist for at least one or two passages of Io, and that the emission cone half angles are approx. 40 to 90 deg., varying from arc to arc. Below 1.2 MHz it was discovered that Jupiter emits radiation strongly modulated in frequency with periods of approx. 200 kHz; this quasi-sinusoidal emission (MSA) can shift more than 180 deg. in phase over periods of 6 seconds, although these shifts are usually much smaller. MSA is not strongly correlated with the longitudes of Io or Jupiter, and typically occurs in patches covering approx. 500 kHz or more for periods of a few minutes. Furthermore, this modulation sometimes resembles a train of impulses in frequency with exponential decays toward high frequencies. Comparison of these results with the previous studies of V-shaped S-bursts is suggestive of an emission mechanism.

16992 (N—87-12407, pp vp) **Planetary Fabry-Perot spectroscopy.** Trauger, J.T. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Uranus and Jupiter HD/H_2 spectra determine bulk D/H ratios which are significantly different from theoretical expectations, with the Uranus D/H about half the Jovian value. Feasibility of Mars photochemistry study with a PEPSIOS spectrometer was demonstrated with visible band O2, H_2O, and CO_2 spectra; and near infrared (1.57 micron) spectra of CO and CO_2; and NASA/IRTF observations have been proposed in support of the Mars Observer mission objectives. Analysis of monochromatic images clearly resolve the azimuthal and radial structure in the Jovian nebula (ion partitioning, temperature structure, ion/neutral interactions), adding a unique and important post-Voyager perspective and providing a baseline for forthcoming Galileo experiments. Simultaneous ground based and IUE observations of Jovian nebula are under analysis. Doppler resolved image sequences (data cubes) of Io sodium neutrals clearly isolate the high velocity charge exchange jet, a sensitive ground-based probe of the tenuous neutral atmosphere of Io.

16993 (N—87-12407, pp vp) **Visible phase curves of Uranus and Neptune and scattering in their atmospheres.** Wenkert, D. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The Voyager 1 and Voyager 2 narrow angle cameras have been imaging Uranus and Neptune (through several filters) from distances of several AU for the past four years. The justification for this is to determine the way in which the albedoes of the two planets vary with angle from the sun. The Voyager 1 spacecraft has already reached a phase angle of approx. 40 deg. for Neptune and approx. 70 deg. for Uranus. The albedo of a gaseous planet depends on the phase angle (angle from the sun through the planet to the observer), the color being observed, and the vertical distribution and nature of aerosols and clouds in the atmosphere of the planet. Since the colors are known and the phase angles, and phase curves will be used to constrain models of the aerosol and cloud structures of Uranus and Neptune. A knowledge of the way albedo varies with phase angle allows one to compute the total amount of sunlight being absorbed by a planet. With knowledge of the solar flux incident on the planet and knowledge of how much infrared is being emitted by the planet (at least in the direction of the Earth and sun) one can determine a rough extimate of the internal heat source of the planet. Although Jupiter and Saturn have measured internal heat sources of magnitude comparable to their absorbed energy from the sun, preliminary results indicate that Uranus may not have an internal heat and that Neptune if it has one that heat source is small.

16994 (N—87-12407, pp vp) **Observations of comets and asteroids.** Ahearn, M.F. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The origin and evolution of the solar system is studied by carrying out a wide variety of observational programs on the small bodies of the solar system. The more immediate observational goal is to determine the physical and chemical nature primarily of comets and secondarily of asteroids. This requires observations at all wavelengths from ultraviolet to radio as well as theoretical modelling.

16995 (N—87-12407, pp vp) **Planetary research at Lowell Observatory.** Baum, W.A.; Millis, R.L.; Lutz, B.L.; Bowell, E.L.G.; Kreidl, T.J.; Schleicher, D.C. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Narrowband CCD profiles of C2 and grains in several comets (including P/Halley and P/Giacobini-Zinner) were performed. Rotational light curves were made of Comet P/Arend-Rigaux (visible and infrared) yielding the size, shape, albedo, and rotation period of the nucleus. Production rates were measured as a function of heliocentric distance for OH, CN, and C2 in P/Giacobini-Zinner and for OH, NH, CN, C3, and C2 in P/Halley. Detection and measurement was made of forbidden (O I) lines near 6300 and 5577 A in P/Halley, permitting the production rate of oxygen from CO to be distinguished from that from H_2O. Identification of C-12, C-13 lines in cometary spectra indicating a possible enrichment of C-13 over the telluric value was made. An assessment of techniques for detecting (determining the existence of) a trans-Neptunian comet belt is included.

16996 (N—87-12407, pp vp) **Infrared spectral studies of asteroids.** Bell, J.F. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The first comprehensive spectrophotometric survey in the near-infrared (0.8 to 2.5 microns) was carried out with the NASA Infrared Telescope Facility and special filters optimized for spectroscopy of solid surfaces. About 105 asteroids have been observed (in 52 photometric passbands) to date. These spectra provide a much improved database for determining the mineralogy of the various asteroid spectral classes previously defined on the basis of

visible (0.3 to 1.0 micron) data. Preliminary results from analysis of these spectra include: (1) Class A asteroids are dominated by olivine and correspond to the rare brachinite meteorites; (2) Class S asteroids have highly variable olivine/pyroxene ratios inconsistent with chondritic compositions; (3) Classes P and D are apparently ultracarbonacous material which extends the known range of chondrites to lower condensation temperatures; (4) the distribution of spectral types shows that the asteroids were heated by a mechanism whose intensity declined rapidly with solar distance; and (5) Spectra of the proposed flyby targets for CRAF were used to evaluate the results obtainable from this mission.

16997 (N—87-12407, pp vp) **Studies of asteroids and comets.** Bowell, E.L.G.; Lumme, K.; Wasserman, L.C.; Kreidl, T.J.N.; Bus, S.J.; Skiff, B.A. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

About 3000 accurate positions of asteroids and comets were measured concentrating particularly on close-Earth approachers, but also targeting asteroids in need for follow-up observations because of unusual orbital characteristics or poor observational history. In 1985, 36 of the discoveries were numbered. Very accurate + or - 0.1 arcsec?) positional measurements were made of P/Halley on four nights in November and December 1985 in support of Giotto mission navigation. The asteroid orbit files were maintained, and ephemeris data for observational planning were supplied to colleagues worldwide. Considerable progress was made in understanding how information on asteroid shapes, surface albedo variegation, and rotational states can be derived from lightcurve and phase curve data. The analytical formulation was completed of a new asteroid magnitude system for the International Astronomical Union; the system was adopted at the New Delhi General Assembly by IAU Commission 20. Photographic photometry of about 10000 images of faint asteroids observed during the course of the United Kingdom Schmidt-CalTech Asteroid Survey in 1981 was continued, completing the microdensitometric scanning and all process of software development for data handling.

16998 (N—87-12407, pp vp) **Imaging studies of comets.** Brandt, J.C. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Extensive photography was conducted on comet Giacobini-Zinner in support of the flyby of the International Cometary Explorer (ICE) through the plasma tail on 9/11/85, and a dense series of plates was secured of Halley's Comet during the 7-month interval approximately centered on perihelion, i.e., 1985 November - 1986 May. The hundreds of high quality plates of Halley contain copious numbers of dramatic plasma events, including DE's, helical waves, and turning tail rays. Initial study of the plate material lends support to the magnetic sector boundary model of DE's developed by Niedner and Brandt.

16999 (N—87-12407, pp vp) **Atlas of Comet Halley 1910 II.** Brandt, J.C.; Donn, B. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

An Atlas of Comet Halley 1910 II photographs and spectra is being prepared. The major section consists of 838 photographic observations from fifteen observatories around the world. Multiple images of many photographs are reproduced to bring out detail in the near nucleus region, in the coma and in the tail. The Atlas contains a total of 1209 photographic images of the 1910 apparition. In addition there are sections showing drawings from 1935 and 1910. A short section compares 1910 drawings and photographs. The final two sections display digitally processed images from 1910 and 1910 spectra. A three part appendix contains diagrams of various data associated with the 1910 apparition, a set of tables of all 1910 images and a bibliography.

17000 (N—87-12407, pp vp) **Composition of faint comets.** Brown, L.W. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The study uses an emission line, differential imaging camera built by the Science Operations Branch. This instrument allows photometric data to be obtained over a large area of a comet in a large number of resolution elements. The detector is a 100x100 Reticon array which with interchangeable optics can give resolutions from 2″ to 30″ over a field of 1′ to 15′. The camera through its controlling computer can simultaneously take images in on-line and continuum filters and through computer subtraction and calibration present a photometric image of the comet produced by only the emission of the molecule under study. Initial work has shown two significant problems. First the auxiliary equipment of the telescope has not allowed the unambiguous location of faint comets so that systematic observations could be made, and secondly initial data has not shown much molecular emission from the faint comets which were located. Work last year on a software and hardware display system and this year on additional guide motors on the 36-inch telescope has allowed the differential camera to act as its own finder and guide scope. Comet IRAS was observed in C2 and CO+, as well as an occultation by the comet of SAO029103. The perodic comet Giacobini-Zinner was also observed in C2.

17001 (N—87-12407, pp vp) **Infrared observations of small solar-system bodies.** Brown, R.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Observations of Europa using the Cooled Grating Array Spectrometer have resulted in the discovery of new absorption features in the spectrum of the trailing side of Europa which have been attributed to either magnetospherically implanted sulfur compounds or recently emplaced hydrates of ammonia. More observations are planned to determine which of these two classes of compounds are responsible. Two asteroid occultations have been observed so far, but with some negative results (the occultations paths shifted sufficiently that the groups responsible for timing the visual occultation got no data). High-quality data in the thermal infrared were obtained nevertheless; those data are useful for constraint of thermal models of asteroids and will be analyzed in that context. Work was completed to perfect a computer code that will fit a triaxial-ellipsoid thermal model to the IR data while constrained by the visual lightcurve.

17002 (N—87-12407, pp vp) **Infrared imaging and photometry of Comet Giacobini-Zinner.** Campins, H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Infrared images and photometry were obtained to determine the spatial distribution and physical characteristics (temperature, albedo, size distribution, total mass, etc.) of the grains in the coma of Comet GZ. A 10.8 m image of Comet GZ obtained on August 4 represents the first ground-based thermal-infrared image of a Comet. Among the most significant results are: (1) an estimate of the number of grains that the ICE spacecraft must have encountered, which led the plasma wave team to conclude that they could only detect impacts on the antennae and not on the whole body of the ICE spacecraft; (2) the discovery of a population of large grains (radius > 100 micrometer), not observed in most other comets, which formed a curved tail near the nucleus (within 80 arcsec or 34,000 km); and (3) the detection of structure in the spatial distribution in the coma of the particle albedo, which was tentatively attributed to the presence of very fluffy grains which are likely to have multiple internal scattering of incident sunlight. The albedo map of Comet GZ was obtained by combining the 10.8 micrometer image shown with a simultaneous image taken at 0.68 micrometer, a bandpass which isolates the scattered continuum.

17003 (N—87-12407, pp vp) **Planetary astronomy.** Chapman, C.R.; Davis, D.R.; Greenberg, R.; Hartmann, W.K. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Comets were studied during their relatively quiescent phases at large distances from the sun. This program has resulted in a variety of CCD images of comets in several visible and near-IR bands selected to sample the continuum, rather than emission features. The most extensive dataset was obtained for P/Halley during January 1985 (plus scattered earlier data), near the time the comet turned on. The data were reduced in a preliminary fashion. Other comets predicted to be relatively inactive (including Neujmin 1 and

Arend-Rigaux) were most active than expected. P/Gehrels 3 was also observed.

17004 (N—87-12407, pp vp) **Speckle interferometry applied to asteroids and other solar system objects.** Drummond, J.D.; Hege, E.K. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Speckle interferometry is a high angular resolution technique that allows study of resolved asteroids. By following the changing size, shape, and orientation of minor planets, and with a few general assumptions (e.g., geometric scattering, triaxial ellipsoid figures, no albedo features), it is possible to directly measure an asteroid's true dimensions and the direction of its spin axis in one or two nights. A particular subset of triaxial ellipsoid figures are equilibrium shapes, and would imply that some asteroids are thoroughly fractured. Such shapes if they exist among the asteroids would allow a determination of bulk density since there is a unique relation among spin period, size, shape, and density. The discovery of even a single rubble pile, (just as the finding of even one binary asteroid by speckle interferometric techniques) would drastically alter the notion of asteroids as small solid planets. The Pluto/Charon system was studied to aid in improving the orbital elements necessary to predict the eclipse/occultation season currently in progress. Four asteroids were reduced to their size, shape, and pole direction: 433 Eros, 532 Herculina, 511 Davida, and 2 Pallas.

17005 (N—87-12407, pp vp) **Planetary spectroscopy.** Fink, U. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Infrared spectroscopic studies of the solar system in support of spacecraft investigations were researched. The studies include the physical behavior of comets, the atmospheres of the gaseous planets, and the solid surfaces of satellites and asteroids. Studies of the gaseous and solid emanations of comets using the techniques of CCD spectroscopy and imaging were focused on. An intensive observational effort was mounted, to observe comet Halley with the recently developed state of the art CCD camera system. Comet P/Giacobini-Zinner was observed. The major emphasis was placed on spectroscopy and a synoptic spectrum at least once a month was obtained. A large number of images of Halley for particular emission species and continuum regions were also obtained. The species in vestigated were: C3 (4060 A), CO+ (4505), C2 (5139), NH_2 (5980), H_2O+ (6185), OI (6300) and CN (9180).

17006 (N—87-12407, pp vp) **Optical investigation of Comet Halley.** Jewitt, D.C. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The optical properties of comet p/Halley are being investigated. Initial research has revealed the basic characteristics of the nucleus and provided unique insights into the formation and structure of the coma and the plasma tail. The study is among the most intensive conducted for any comet. The results from comet p/Halley may be useful in the interpretation of results from other comets.

17007 (N—87-12407, pp vp) **Cometary spectroscopy.** Larson, S. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The spectroscopic and morphological characteristics of comets over a wide range of heliocentric distances are investigated as they may suggest or constrain models of cometary formation environments and evolution. This program also contributes to the understanding of the general comet population with which spacecraft data will be compared. Long slit spectra and direct images of all observable comets (M2<18) are obtained on a monthly basis with either a UV sensitive microchannel plate or a red sensitive CCD spectrograph/camera. Scale lengths of the principal emission of OH, NH, CN, C_3, C_2, NH_2 and OI different comets can be compared. The direct images are used for studies of dust anisotropy which can provide data on the spin vector and gross surface morphology.

17008 (N—87-12407, pp vp) **Infrared observations of planets.** Lebofsky, L.A.; Rieke, G.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

A positive correlation was found between the strength of the 3-micron water feature and the strength of the absorption feature shortward of 0.4 microns. This is similar to what is seen in laboratory spectra of carbonaceous chondrites whose silicate compositions range from hydrated phyllosilicates to anhydrous olivine. Features were found in the IRAS images that appear to be related to solar system objects. Analysis of the data has yielded narrow trails of dust coincident with the orbits of comets Temple 2, Encke, and Gunn. Dust is found both ahead and behind comet orbital positions due to low-velocity ejection of large particles during perihelion passage. The occultation diameters of Ceres and Pallas were used to improve the standard thermal model used in the reduction of thermal IR observations of asteroids.

17009 (N—87-12407, pp vp) **Asteroid team.** Matson, D.L. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Work on asteroid classification continued was rewarded with the discovery of two Earth-approaching M asteroids. The M class is rare and these are the first found among the near-Earth asteroids to have the spectral albedo characteristic of this class. The two asteroids are newly discovered 1986 DA and 1986 EB, which were observed at N and Q bandpasses (i.e., 10 and 20 microns) with the 3 m IRTF telescope and at five wavelengths from 0.36 to 0.85 microns from Kitt peak National Observatory's 0.36 m telescope. The derived diameters are about 2 km for both objects. In the asteroid radiometry program N or Q photometry was obtained for more than 40 asteroids in Feb. 1986. Radiometric diameter calibration support were provided for stellar occultations of stars by 230 Athamantis and 129 Antigone. The data were reduced but not analyzed. Infrared spectra (0.8 to 2.6 microns) of 60 asteroids were reduced and are now ready for compositional analysis.

17010 (N—87-12407, pp vp) **Planet-crossing asteroids: interrelationships within the solar system.** Mcfadden, L.A.; Ahearn, M.F. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Near-infrared reflectance spectra, 0.6 to 2.5 micrometer, were acquired of asteroids 1627 Ivar (Amor), 43 Ariadne, 335 Roberta, 386 Siegena and 695 Bella (3:1 Kirkwood Gap) with the IRTF, Mauna Kea. CCD spectra 0.5-1.0 micrometer were acquired of 1866 Sisyphus (Apollo), 17 Thetis, 695 Bella, 797 Montana, and 877 Walkure (3:1 Kirkwood Gap) using facilities at Cerro Tololo Inter-American Observatory. An upper limit on the production rate of CN in asteroid 3200 Phaeton of $< 4 \times 10$ to the 23rd power sec was determined based on photometric measurements at 3871A using facilities at Lowell Observatory. This value is in the range of the lowest production rate measured for a comet, however, it does not constitute a positive detection of CN in this asteroid. A first attempt of look for companion objects or evidence of dust debris associated with this asteroid was made with a CCD camera. Whereas the search extended to 19th magnitude (corresponding to 150m and 330m for albedos of 0.15 and 0.03 respectively), a look close enough to the asteroid was not attained to definitively eliminate the presence of coorbiting dust debris.

17011 (N—87-12407, pp vp) **Physical processes in comets.** Newburn, R.L. Jr. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Final revisions were made in the study of continuum spectrophotometry of 17 comets done at Lick Observatory. Changes based upon this study were introduced into the Divine-Newburn cometary modelling paradigm. Work was begun on modifications to all of the theory based upon the direct nucleus and coma observations made by the Halley space missions.

17012 (N—87-12407, pp vp) **Ground-based observation of Comet Halley.** Scherb, F.; Roesler, F.L. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Approximately five hundred Fabry-Perot scans of H_3O+, H alpha, and (OI) emissions from comets Halley, Hartley-Good, and Thiele were obtained at Kitt Peak in November, December and January. The analysis of the data is in a very early stage, but preliminary results were obtained on the production rate Q(H) of hydrogen, Q(D) of metastable oxygen, and Q(H_2O) of water. The rate Q(H) varied with heliocentric distance R as R to the power -3.5 + or - 0.5. The rate Q(D) varied as R to the power -4.8 + or - 0.1. The ratio of Q(H_2O) to Q(D) was 15 + or - 5.

17013 (N—87-12407, pp vp) **High resolution spectral imagery of comets.** Smith, W.H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

C-13/C-12 data at a spectral resolution of 75,000, resolving the background interferences was obtained. Some data was obtained for N-15/N-14. In April, observations were obtained for the D/H ratio. The model analysis of these observations is beginning with the goal of presentation at the Heidelberg Halley meeting. A very large quantity of observations were obtained of both features with variations on the time scale of an hour being measured. At times, the 5577 feature dominates, and at times it is nearly absent. To date, a large body of data have been obtained for C_2, NH_2, (O I), and probably H_3O+, CN, and from the MKO data, OH. These features can all be correlated with respect to their relative velocities and distribution at the time of observation. The Greenstein effect will be used to measure similar results for CN, OH, and few other selected molecular features.

17014 (N—87-12407, pp vp) **Spatially resolved quantitative spectroscopy of comets.** Spinrad, H. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The pristine nucleus of a comet, in particular, its chemical composition is studied. More immediate goals are to quantitatively compare the mass-loss-rates of various periodic comets, and to map out the distribution of coma region ions and neutral radicals with the hope of indirectly determining their parent molecules.

17015 (N—87-12407, pp vp) **Physical properties of asteroids.** Veeder, G.J. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The physical properties of asteroids were studied by telescopic observations and laboratory and theoretical work. Spectrophotometry from 0.3 to 1.1 microns and 1.2, 1.6 and 2.2 micron photometry allow spectral-compositional classification of asteroids. Based on laboratory data and telescopic observations, it was found that infrared measurements at 1.2, 1.6 and 2.2 microns provide a relatively rapid and accurate method for the classification of minor planets and are important in comparing asteroids with meteorites. This technique was proven and employed in an expanded survey of Apollo-Amor-Aten and other unusual asteroids recently scanned by IRAS.

17016 (N—87-12407, pp vp) **Origin of asteroids and small bodies.** Williams, J.G.; Gibson, J. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

During the past year three periodic comets were recovered. They were Tsuchinshan 2, Whipple, and Daniel. Follow up positions on four newly discovered comets appeared on IAU cards: Machholz, Hartley, Maury, and Shoemaker 3. Halley was captured shortly after its 1985 conjunction and a set of exposures in late summer was one of the earliest showing tail development. A variety of interesting asteroids were also captured.

17017 (N—87-12407, pp vp) **Spectroscopy of comets.** Wyckoff, S.; Wehinger, P.A. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Comets constitute the most accessible samples of the outer solar system in its most primitive state. The physical and chemical properties of comet nuclei were determined to infer the conditions and processes related to the origin and evolution of the outer solar system. The procedure is to acquire and analyze digital spectra of a sample of comets covering a large range in heliocentric distance. During 1984 to 1986 the emphasis has been on Comet P/Halley (1982i). Large ground-based telescopes and state-of-the-art detectors were used to observe Comet P/Halley pre- and post-perihelion, covering a heliocentric distance range, 0.9 to 6.1 AU.

17018 (N—87-12407, pp vp) **Cometary dynamics.** Yeomans, D.K. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

In order to provide observers with accurate cometary ephemerides, up-to-date astrometric positions must be used to update the existing orbit and ephemeris for each object. In addition, nongravitational forces must be taken into account; these forces are assumed due to the rocket effect of outgassing cometary ices. Once successfully modeled, the cometary nucleus spin direction, spin axis evolution, and the volatility of the nucleus ices can be inferred. The predicted ephemerides also become far more accurate.

17019 (N—87-12407, pp vp) **Spectroscopic planetary detection.** Deming, D.; Espenak, F.; Hillman, J.J.; Kostiuk, T.; Mumma, M.J.; Jennings, D.E. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The Sun-as-a-star was monitored using the McMath Fourier transform spectometer (FTS) on Kitt Peak in 1983. In 1985 the first measurement was made using the laser heterodyne technique. The FTS measurements now extend for three years, with errors of order 3 meters/sec at a given epoch. Over this 3 year period, a 33 meter/sec change was measured in the apparent velocity of integrated sunlight. The sense of the effect is that a greater blueshift is seen near solar minimum, which is consistent with expectations based on considering the changing morphology of solar granular convection. Presuming this effect is solar-cycle-related, it will mimic the Doppler reflex produced by a planetary companion of approximately two Jupiter masses, with an 11 year orbital period. Thus, Jupiter itself is below the threshold for detection by spectroscopic means, without an additional technique for discrimination. However, for planetary companions in shorter period orbits (P approx. 3 years) the threshold for unambiguous detection is well below one Jupiter mass.

17020 (N—87-12407, pp vp) **Stellar observations with the Voyager EUV objective grating spectrograph.** Holberg, J.B.; Polidan, R.S.; Barry, D.C. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

During the periods of interplanetary cruise the Voyager ultraviolet spectrometers are used to provide unique and otherwise unobtainable observations in the extreme ultraviolet (EUV, 500 to 1200) and the far ultraviolet (FUV, 912 to 1220 A). These observations include the spectra of hot stellar sources as well as emission from the interplanetary medium. Recent results of note include: (1) extensive spectrophotometric coverage of a superoutburst of the dwarf nova VW Hydri, which showed a clear 1/2 day delay in the outburst at 1000 A relative to that observed in the optical and a curious dip in the FUV light curve near maximum light. The Voyager observations were part of a comprehensive and highly successful campaign involving EXOSAT, IUE and ground based observations of this dwarf nova; (2) a comprehensive study of Be star spectra and variability. These results show the critical importance of FUV observations in the study of the effects of stellar rotation in hot stars; (3) the detection of a strong O VI absorption feature in the spectrum of the PG 1159-like object H1504+65. This detection along with the optical identification of weak O IV lines was a key to the interpretation of this object; which is of extremely high (>150,000K) temperature and appears to be a unique example of a stellar atmosphere devoid of H and He; (4) an analysis of an extremely long duration spectrum of the EUV and FUV sky background, which establishes important new upper limits on both continuum and line emission. This result also provide the first detection of interplanetary Lyman gamma.

17021 (N—87-12407, pp vp) **Jets, mass outflows and disks associated with young stellar objects.** Strom, S.E. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Over the past 3 years, a series was obtained of the CCD images of regions surrounding young stellar objects (YSO's) located in a variety of environments with the goal of providing a census of the properties of mass outflows associated these objects. A catalog describing the optical morphology and kinematics of 38 mass outflows associated with young stellar objects (YSOs) was completed. The direct detection was reported of disks surrounding HL Tau and LI551/IRS 5 -- both sources of optical jets and large-scale mass outflows. In each case, the disk dimensions are on the order of several hundred astronomical units and the disk dust masses approximately 10 to the -7th power solar masses. A program aimed at indirect detection of circumstellar disks associated with YSOs was started. The technique involves comparison of an observed bolometric luminosity (L(bol)) with an independent measure of the true luminosity (L(spec)) of a YSO which derives from the observed strengths of surface-gravity-sensitive spectral features.

17022 (N—87-12407, pp vp) **Planetary optical and infrared imaging.** Terrile, R.J.; Smith, B.A. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Images were acquired of a circumstellar disk of orbiting material around the nearby star beta Pictoris. This material is believed to be associated with the formation of planets and provides a first look at a planetary system much younger than our own. Preliminary work was also done to acquire multicolor photometric data and polarimetry on the beta Pictoris disk as well. A coronagraphic search for other proto-planetary systems is also underway. Coronagraphic imaging provided the first clear images and a determination of the geometric albedo of the rings of Uranus. A search for material around the asteroid Amphitrite showed that the region around the asteroid was free of particles larger than 500 meters in radius or diffuse material with an optical depth larger than .000001. NASA IRTF infrared images of Jupiter and Saturn are providing information on the relative heights and cloud top temperatures of atmospheric features.

17023 (N—87-12407, pp vp) **Interplanetary and interstellar dust.** Sandford, S. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Several processed polycyclic aromatic hydrocarbons (PAH) samples were produced to date. The Raman spectra and D/H ratios of these samples will be studied in the near future. A manuscript was sent to Icarus which gives a detailed discussion of the possibility of using solar flare tracks in interplanetary dust particles (IDPs) to determine a cometary vs. asteroidal source of the IDPs. The technique looks promising and a program was started to measure the large number of IDP track density necessary to address the issue of the source(s) of the dust. The results could potentially tell a great deal about comets and/or asteroids.

17024 (N—87-12407, pp vp) **International Halley Watch: discipline specialists for photometry and polarimetry.** Ahearn, M.F. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The last of the 75 sets of standard filters were distributed, including re-allocation of several sets from north to south at the beginning of 1986. Observations of the photometric standard stars from several observatories were collected and synthesized into a standard system of magnitudes. Transformation equations were derived to yield absolute fluxes in various cometary emission bands and in the continuum. These transformations turned out to vary with the comet's radial velocity for some filters and with the filter's temperature for some filters, and from one set of filters to another, all effects were quantitatively assessed. Non-linearities in the extinction, observed through the OH filter, were modelled and techniques for linearizing the extinction were developed. Although not among the official goals of the IHW, NASA Headquarters chose to work through the IHW to develop two CCD camera systems. Two iterations of an archive format were performed and a third is in the works.

17025 (N—87-12407, pp vp) **International Halley Watch: discipline specialists for radio science.** Irvine, W.M.; Schloerb, F.P.; Gerard, E.; Brown, R.D.; Godfrey, P. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Some 34 radio observatories in 18 countries are participating in the Radio Science Net of the International Halley Watch. Approximately 100 radio astronomers are contributing to this effort, which has included observations of comets P/Crommelin and P/Giacobini-Zinner as well as P/Halley. It is clear that the record of data for the 18 cm OH ground state lambda doublet, which provides fundamental information on the gas production rate, kinematics, and potentially the magnetic field in the coma, will be vastly more complete and of higher accuracy than has even been obtained on any previous comet. The coverage by a number of radio observatories will enable short period variations to be studied and correlated with simultaneous data obtained at other wavelengths. Likewise, the first definitive detection of the important parent molecule hydrogen cyanide in a comet was obtained and is being studied by groups in the United States, Sweden, and France. The first detection of the comet with the Very Large Array telescope operated by NRAO was achieved and has produced exciting results for the distribution of emission at high angular resolution from the OH radical. At this writing data are still being obtained and being processed, and there are still strong indications that exciting information will be obtained from radar studies of P/Halley and from searches for additional parent molecules.

17026 (N—87-12407, pp vp) **International Halley Watch: discipline specialists for infrared spectroscopy and radiometry.** Knacke, R.F.; Encrenaz, T. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The Infrared Net has been active in all areas of comet science in its domain. The more than 100 members of the net and 30 participating observatories are still engaged in observations, and only a preliminary discussion of the highlights of the program is possible at this time.

17027 (N—87-12407, pp vp) **International Halley Watch: discipline specialists for near-nucleus studies.** Larson, S.; Sekanina, Z.; Rahe, J. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

The purpose of the Near-Nucleus Studies Net is to study the processes taking place in the near-nucleus environment as they relate to the nature of the nucleus. This is accomplisghed by measuring the spatial and temporal distribution of dust, gases and ions in the coma on high resolution images taken from many observatories around the world. By modeling the motions of discrete dust features in Comet Halley, it is often possible to determine the locations of the emission sources on the surface and learn about the nucleus structure. In addition to the general goals shared by all IHW nets, the scientific goals of the net has been to determine (1) the gross surface structure of the nucleus, (2) the nucleus spin vector, (3) the distribution and evolution of jet sources and (4) the interrelationships between the gas, dust and ion components of the coma. An additional Comet Giacobini-Zinner watch was carried out by the NNSN in support of the NASA International Cometary Explorer flyby.

17028 (N—87-12407, pp vp) **International Halley Watch: discipline specialists for spectroscopy and spectrophotometry.** Wyckoff, S.; Feston, M.C.; Wehinger, P. Sep 1986. NTIS, PC A10/MF A01. (NASA-TM—89189; NAS—1.15:89189).

In Reports of planetary astronomy, 1985.

Spectroscopic observations of Comets P/Crommelin, P/Giacobini-Zinner and P/Halley are coordinated, preliminary results are delivered to the astronomical community and the data collected from observers throughout the world are archived. The ASU IHW Center has the additional responsibility of maintaining the IHW Electronic Bulletin Board which reports real-time information on

the status of Comet P/Halley. Access to this electronic bulletin board via telephone modem connection is available to any astronomer upon request.

17029 **(N—87-12508) Antarctic meteorite newsletter, volume 9, number 1.** (National Aeronautics and Space Administration, Houston, TX (USA). Lyndon B. Johnson Space Center). Feb 1986. 29p. (NASA-TM—89230; NAS—1.15:89230). NTIS, PC A03/MF A01.

Topics addressed include: petrographic descriptions of new meteorites; homogeneous powders of Antarctic meteorites; policy on consortium studies, and saw-cut surfaces of Shergottite EETA79001.

17030 **(N—87-12510) Chromospheric activity of cool giant stars. Final report.** Steiman-Cameron, T.Y. (Carnegie Institution of Washington, DC (USA)). Nov 1986. 9p. (NASA-CR—177184; NAS—1.26:177184). NTIS, PC A02/MF A01.

During the seventh year of IUE twenty-six spectra of seventeen cool giant stars ranging in spectral type from K3 thru M6 were obtained. Together with spectra of fifteen stars observed during the sixth year of IUE, these low-resolution spectra have been used to: (1) examine chromospheric activity in the program stars and late type giants in general, and (2) evaluate the extent to which nonradiative heating affects the upper levels of cool giant photospheres. The stars observed in this study all have well determined TiO band strengths, angular diameters (determined from lunar occulations), bolometric fluxes, and effective temperatures. Chromospheric activity can therefore be related to effective temperatures providing a clearer picture of activity among cool giant stars than previously available. The stars observed are listed.

17031 **(N—87-12519) Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986.** Smyth, W.H.; Combi, M.R. (Atmospheric and Environmental Research, Inc., Cambridge, MA (USA)). Sep 1986. 28p. (NASA-CR—176888; NAS—1.26:176888). NTIS, PC A03/MF A01.

An analysis of the extended atmospheres of outer planet satellites and comets is made. Primary emphasis is placed on cometary atmospheres because of the return of Comet P/Halley. As part of a collaborative effort with A.I.F. Stewart, observations of the hydrogen coma of Comet P/Giacobini-Zinner obtained from the Pioneer Venus Orbiter ultraviolet spectrometer (PVOUVS) were successfully analyzed at AER and are reported. In addition, significant pre-modeling and post-modeling activities to support and analyze the PVOUVS observations of Comet P/Halley successfully acquired in late 1985 and early 1986 are also discussed. Progress in model preparation for third-year analysis of the Voyager UVS Lyman-alpha brightness distribution emitted by hydrogen atoms in the Saturn system is also summarized.

17032 **(N—87-12520) Pioneer 10 and 11 (Jupiter and Saturn) magnetic field experiments. Final report.** Jones, D.E. (Brigham Young Univ., Provo, UT (USA)). Oct 1986. 133p. (NASA-CR—179856; NAS—1.26:179856). NTIS, PC A07/MF A01.

Magnet field data obtained by the vector helium magnetometer (VHM) during the encounters of Jupiter (Pioneer 10 and 11) and Saturn (Pioneer 11) was analyzed and interpreted. The puzzling characteristics of the Jovian and Saturnian magnetospheric magnetic fields were studied. An apparent substorm (including thinning of the dayside tail current sheet) was observed at Jupiter, as well as evidence suggesting that at the magnetopause the cusp is at an abnormally low latitude. The characteristics of Saturn's ring current as observed by Pioneer 11 were dramatically different from those suggested by the Voyager observations. Most importantly, very strong perturbations in the azimuthal ring current magnetic field suggest that the plane of the ring was not in the dipole equatorial plane, being tilted 5 to 10 deg. relative to the dipole and undergoing significant changes during the encounter. When these changing currents were corrected for, an improved planetary field determination was obtained. In addition, the ring and azimuthal currents at Saturn displayed significantly different time dependences.

17033 **(N—87-12522) Simultaneous solar maximum mission (SMM) and very large array observations of solar active regions. Annual report, 1 September 1985-30 October 1986.** Lang, K.R. (Tufts Univ., Medford, MA (USA)). Oct 1986. 158p. (NASA-CR—177187; NAS—1.26:177187). NTIS, PC A08/MF A01.

The research deals mainly with Very Large Array and Solar Maximum Mission observations of the ubiquitous coronal loops that dominate the structure of the low corona. As illustrated, the observations of thermal cyclotron lines at microwave wavelengths provide a powerful new method of accurately specifying the coronal magnetic field strength. Processes are delineated that trigger solar eruptions from coronal loops, including preburst heating and the magnetic interaction of coronal loops. Evidence for coherent burst mechanisms is provided for both the Sun and nearby stars, while other observations suggest the presence of currents that may amplify the coronal magnetic field to unexpectedly high levels. The existence is reported of a new class of compact, variable moving sources in regions of apparently weak photospheric field.

17034 **(N—87-12523) Solar flare x-ray polarimetry. Final scientific report, 1 April 1984-30 September 1986.** Chanan, G.A.; Novick, R. (California Univ., Irvine (USA)). Oct 1986. 36p. (NASA-CR—179899; NAS—1.26:179899). NTIS, PC A03/MF A01.

The motivation for high quality solar flare x-ray polarization measurements are discussed in general. The design of the proposed instrument is described and then the sensitivity and energy response are discussed. The laboratory work which demonstrates that the earlier lithium contamination problem was solved is described.

17035 **(N—87-13363) Infrared reflection nebulae in Orion molecular cloud 2.** Pendleton, Y.; Werner, M.W.; Capps, R.; Lester, D. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center). Jun 1986. 46p. (NASA-TM—88259; A—86276; NAS—1.15:88259). NTIS, PC A03/MF A01.

New obervations of Orion Molecular Cloud-2 have been made from 1-100 microns using the NASA Infrared Telescope Facility and the Kuiper Airborne Observatory. An extensive program of polarimetry, photometry and spectrophotometry has shown that the extended emission regions associated with two of the previously known near infrared sources, IRS1 and IRS4, are infrared reflection nebulae, and that the compact sources IRS1 and IRS4 are the main luminosity sources in the cloud. The constraints from the far infrared observations and an analysis of the scattered light from the IRS1 nebula show that OMC-2/IRS1 can be characterized by L less than or equal to 500 Solar luminosities and T approx. 1000 K. The near infrared (1-5) micron albedo of the grains in the IRS1 nebula is greater than 0.08.

17036 **(N—87-13365) Observational study of ion-electron equilibration and of cloud evaporation in supernova remnants under the HEAO-2 guest investigator program. Final project report, 1 June 1985-30 September 1986.** Teske, R.G. (Michigan Univ., Ann Arbor (USA)). Sep 1986. 11p. (NASA-CR—179922; NAS—1.26:179922). NTIS, PC A02/MF A01.

Observations of three selected supernovae remnants (Cygnus Loop, IC 443, and Puppis A) were made in the forbidden coronal iron lines (Fe X) lambda 6374 and (Fe XIV) lambda 5303. The resulting data was compared quantitatively with Einstein images of the same objects, and an attempt was made to determine (a) the process by which ion and electron energies are equilibrated behind the shock front in the ISM and (b) whether cloud evaporation occurs within the hot remnant interiors. Spatially-resolved x-ray emission were modeled for Sedov-Taylor blast wave models of supernovae remnants (SNR) under conditions of non-equilibrium ionization. The computations are intended to provide results that can be directly compared with Einstein high resolution image (HRI) and imaging proportional counter (IPS) data. The computer program for predicting the spatial distribution of HRI and IPS counting rates was completed, and final testing of it had begun.

17037 (N—87-13366) **High energy neutrino absorption and its effects on stars in close x-ray binaries.** Gaisser, T.K.; Stecker, F.W. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jul 1986. 21p. (NASA-TM—89269; NAS—1.15:89269). NTIS, PC A02/MF A01.

The physics and astrophysics of high energy neutrino production and interactions in close x-ray binary systems are studied. These studies were stimulated by recent observations of ultrahigh energy gamma rays and possibly other ultrahigh energy particles coming from the directions of Cygnus X-3 and other binary systems and possessing the periodicity characteristics of these systems. Systems in which a compact object, such as a neutron star, is a strong source of high energy particles which, in turn, produce photons, neutronos and other secondary particles by interactions in the atmosphere of the companion star were considered. The highest energy neutrinos are absorbed deep in the companion and the associated energy deposition may be large enough to effect its structure or lead to its ultimate disruption. This neutrino heating was evaluated, starting with a detailed numerical calculation of the hadronic cascade induced in the atmosphere of the companion star. For some theoretical models, the resulting energy deposition from neutrino absorption may be so great as to disrupt the companion star over an astronomically small timescale of the order of 10,000 years. Even if the energy deposition is smaller, it may still be high enough to alter the system substantially, perhaps leading to quenching of high energy signals from the source. Given the cosmic ray luminosities required to produce the observed gamma rays from cygnus X-3 and LMX X-4, such a situation may occur in these sources.

17038 (N—87-13367) **Two states of CYG X-1 and related sources.** Kazanas, D. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jul 1986. 15p. (NASA-TM—89265; NAS—1.15:89265). NTIS, PC A02/MF A01.

A model for active galactic nuclei (AGN), employing quasi-spherical accretion onto a black hole, when scaled down to solar mass objects, provides a straightforward account of the bimodal spectral behavior of Cyg X-1 and the other galactic black hole candidates. It is argued that the change in the spectrum is due to the drastic increase of the source compactness (L/R) with the accretion rate m and the subsequent conversion of most of the energy released by accretion into e(+)e(-) pairs. It is also argued that similar changes may be observed in active galactic nuclei.

17039 (N—87-13368) **Continuum radiation from active galactic nuclei: a statistical study.** Isobe, T.; Feigelson, E.D.; Singh, K.P.; Kembhavi, A. (Pennsylvania State Univ., University Park (USA). Davey Lab.). 1986. 81p. (NASA-CR—179925; NAS—1.26:179925). NTIS, PC A05/MF A01.

The physics of the continuum spectrum of active galactic nuclei (AGNs) was examined using a large data set and rigorous statistical methods. A data base was constructed for 469 objects which include radio selected quasars, optically selected quasars, x-ray selected AGNs, BL Lac objects, and optically unidentified compact radio sources. Each object has measurements of its radio, optical, x-ray core continuum luminosity, though many of them are upper limits. Since many radio sources have extended components, the core component were carefully selected out from the total radio luminosity. With survival analysis statistical methods, which can treat upper limits correctly, these data can yield better statistical results than those previously obtained. A variety of statistical tests are performed, such as the comparison of the luminosity functions in different subsamples and linear regressions of luminosities in different bands. Interpretation of the results leads to the following tentative conclusions: the main emission mechanism of optically selected quasars and x-ray selected AGNs is thermal, while that of BL Lac objects is synchrotron; radio selected quasars may have two different emission mechanisms in the x-ray band; BL Lac objects appear to be special cases of the radio selected quasars; some compact radio sources show the possibility of synchrotron self-Compton (SSC) in the optical band; and the spectral index between the optical and the x-ray bands depends on the optical luminosity.

17040 (N—87-13379) **MAX '91: an advanced payload for the exploration of high energy processes on the active sun.** (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jun 1986. 62p. (NASA-TM—89271; NAS—1.15:89271). NTIS, PC A04/MF A01.

The results of a NASA science working group established to study a follow-on to the Solar Maximum Mission are given. A complement of instruments is suggested, with the primary objective of studying the physics of energetic processes in cosmic plasmas by observing high-energy phenomena in solar flares. High-quality flare observations will be possible with these instruments during the next peak in solar activity expected to last from 1990 through at least 1995. The primary objective of MAX '91 is to study energetic processes in cosmic plasmas by observing high-energy phenomena in solar flares. These processes, which are of general astrophysical importance, include energy release, particle acceleration, and energy transport. Results from comprehensive observing programs conducted during the last solar cycle have demonstrated the great scientific potential of high-energy emissions for addressing these central physical processes. Consequently, a payload optimized for observations of high-energy solar flare phenomena is suggested for MAX '91. It consists of the following four specific instruments: (1) a Fourier-transform x-ray and gamma-ray imager covering the energy range from a few keV to 1 MeV with arcsecond spatial resolution; (2) a cooled germanium x-ray and gamma-ray spectrometer with keV spectral resolution covering the energy range from 10 keV to 50 MeV; (3) Bragg spectrometers with high spectral resolution at wavelengths between 1 and 9 angstrons; and (4) a soft x-ray, EUV, or UV imaging instrument with arcsecond spatial resolution.

17041 (N—87-13394) **Gamma-ray spectrometer experiment on the solar maximum mission satellite. Final report, 16 October 1984-15 April 1986.** Chupp, E.L. (New Hampshire Univ., Durham (USA)). Apr 1986. 67p. (NASA-CR—177877; NAS—1.26:177877). NTIS, PC A04/MF A01.

Observations by the Gamma-Ray Spectrometer (GRS) on the Solar Maximum Mission (SMM) are examined. This detector system is sensitive to high-energy x rays, gamma rays, and energetic neutrons. These neutral quanta provide a probe of the highest energy processes in a flare. The GRS has recorded over 150 flares since launch. In addition to the solar discoveries, the SMM GRS has made important discoveries about cosmic gamma sources. These discoveries are summarized.

17042 (N—87-13395) **Neutron and antineutron production in accretion onto compact objects.** Dermer, C.D.; Ramaty, R. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jul 1986. 16p. (NASA-TM—89264; NAS—1.15:89264). NTIS, PC A02/MF A01.

Nuclear reactions in the hot accretion plasma surrounding a collapsed star are a source of neutrons, primarily through spallation and pion-producing reactions, and antineutrons, principally through the reaction p+p yields p+p+n+anti-n. We calculate spectra of neutrons and antineutrons produced by a variety of nonthermal energetic particle distributions in which the target particles are either at rest or in motion. If only neutral particles are free to escape the interaction site, a component of the proton and antiproton fluxes in the cosmic radiation results from the neutrons and antineutrons which leave the accretion plasma and subsequently decay in the interstellar medium. This additional antiproton component could account for the enhanced flux of antiprotons in the cosmic radiation, compared to values expected from the standard leaky-box model of cosmic-ray propagation and confinement. Moreover, the low-energy antiproton flux measured by Buffington, et al., (1981) could result from target-particle motion in the accretion plasma. This model for the origin of antiprotons predicts a narrow 2.223 MeV line which could be observable.

17043 (NORDITA—84/43-Prepr.) **Frequency dependent polarization in blazars.** Bjoernsson, C.I. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). Oct 1984. 38p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750526.

It is argued that the intrinsic frequency dependent polarization in blazars finds its most straight forward explanations in terms of a single rather than a multicomponent sourcemodel. In order to reproduce the observations, under the assumption that the emission mechanism is optically thin synchrotron radiation, both a well ordered magnetic field and an electron distribution with a sharp break or cuttoff are necessary. Non-uniform pitch angle distribution and/or environments where synchrotron losses are important are both conducive to producing strong frequency dependent polarization. Reasons are put forth as to why such conditions are expected to occur in blazars. Two specific models are discussed in detail and it is shown that they are both able to produce strong frequency dependent polarization, even when the spectral index changes by a small amount only.

17044 **(NORDITA—84/44-Prepr.) Solar oscillations.** Christensen-Dalsgaard, J. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). 1984. 11p. (CONF-8410299—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750527.

From 4. European meeting on solar physics; Noordwijkerhout, Netherlands (1 Oct 1984).

Observed frequencies of solar oscillations comprise an extensive and accurate set of data related to the structure and dynamics of the solar interior. The physics determining the oscillation frequencies is sufficiently simple that a very detailed comparison between observations and theory is possible. This has provided tight constraints on the structure of the solar interior, as well as measurements of the variation of the solar rotation with depth.

17045 **(NORDITA—85/12-Prepr.) Correlation functions for the clustering of galaxies and Abell clusters.** Jones, B.J.T.; Jones, J.E. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). 1985. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750528.

The difference in amplitudes between the galaxy-galaxy correlation function and the correlation function between Abell clusters is a consequence of two facts. Firstly, most Abell clusters with $z<0.08$ lie in a relatively small volume of the sampled space, and secondly, the fraction of galaxies lying in Abell clusters differs considerably inside and outside of this volume. (The Abell clusters are confined to a smaller volume of space than are the galaxies.) We discuss the implications of this interpretation of the clustering correlation functions and present a simple model showing how such a situation may arise quite naturally in standard theories for galaxy formation.

17046 **(NORDITA—85/15-Prepr.) Helioseismology.** Christensen-Dalsgaard, J. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). 1985. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750531.

The study of the solar interior structure and dynamics by means of observations of solar oscillations has matured very considerably during the last three years. In 1981 the existence of global solar oscillations had been firmly established, although in most cases the modes of oscillation had not yet been definitely identified. Now a direct determination of the sound speed in a large part of the solar interior has become possible, and the equatorial rotation rate has been measured in most of the sun.

17047 **(NORDITA—85/17-Prepr.) Primordial shear and the question of inflation.** Gonzalez, E.M.; Jones, B.J.T. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). May 1985. 26p. Nordisk Inst. for Teoretisk Atomfysik, Copenhagen, Denmark.

Also published in Phys. Lett., B (30 Jan 1986) Vol. 167(1) p. 37-42.

We discuss the role of primordial shear in two inflationary scenarios, Planck-time (Linde) inflation and the GUT inflation. In the Linde picture, including a simple "particle creation" term produces universes in which the temperature rapidly attains a stable asymptotic value just below the Planck temperature, whatever the Higgs field coupling constant. We thus have an extremely isotropic, geometrically flat, high temperature and density "steady state" universe, awaiting a spontaneous phase transition to a "normal" state of matter that permits the standard FRW evolution. In the GUT picture, inflation can occur notwithstanding the presence of anisotropy. However, in these models, initial anisotropy reduces the GUT era coherence length and it becomes more difficult to form the present universe from a single bubble.

17048 **(NORDITA—85/18-Prepr.) Cosmology and galaxy formation. An introduction to some recent ideas.** Jones, B.J.T.; Gonzalez, E.M. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). May 1985. 43p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750532.

The aim of the present series of lectures is to be unashamedly pedagogical and present, in simple terms, an overview of our current thinking about our universe and the way in which we believe galaxies have formed.

17049 **(NORDITA—85/19-Prepr.) Early galactic evolution and the nature of the first stars.** Jones, J.E. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). May 1985. 56p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87750529.

In this paper, the observational data relating to the early evolution of the Galaxy are reviewed in order to assess the plausibility of a number of models that have been proposed for the first stars. On the basis of standard fragmentation models, it is argued that primordial stars were very similar to normal stars, but that in some circumstances the formation of low mass primordial stars may be suppressed through the dissociation of molecular hydrogen by UV radiation. The existence of these conditions at the time of formation of the Galaxy could explain the absence of zero-metal stars.

17050 **(PB—87-107595/XAB) Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data.** Coffey, H.E. (National Geophysical Data Center, Boulder, CO (USA)). Aug 1986. 88p. (SGD—504-PT-1). NTIS, PC A05/MF A01.

Contents include: Detailed index for 1985-86; Data for July 1986-(IUWDS alert periods (Advance and worldwide); Solar-activity indices, Solar flares, Solar radio emission, Stanford mean solar magnetic field); Data for June 1986-(Solar-active regions, Solar radio-spectral observations, Cosmic-ray measurements by neutron monitor, Geomagnetic indices, Radio-propagation indices); Late data-(Cosmic-ray measurements by neutron monitor Sep 85 - May 86, Geomagnetic indices).

17051 **(PB—87-107603/XAB) Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986.** Coffey, H.E. (National Geophysical Data Center, Boulder, CO (USA)). Aug 1986. 60p. (SGD—504-PT-2). NTIS, PC A04/MF A01.

Contents include: Detailed index for 1985-86; Data for February 1986-(Meudon carte synoptique, Solar flares, Solar radio bursts at fixed frequencies, Solar x-ray radiation from GOES satellite graphs; Mass ejections from the sun; Active prominences and filaments.

17052 **(PB—87-114252/XAB) Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data.** Coffey, H.E. (National Geophysical Data Center, Boulder, CO (USA)). Sep 1986. 86p. NTIS, PC A05/MF A01.

Contents include: Detailed index for 1986; Data for August 1986-(IUWDS alert periods (Advance and worldwide), Solar activity indices, Solar flares, Solar radio emission, Stanford mean solar magnetic field); Data for July 1986-(Solar-active regions, Sudden ionospheric disturbances, Solar-radio-spectral observations, Cosmic-ray measurements by neutron monitor, Geomagnetic indices, Radio-propagation indices); Late data-(Solar radio emission June-July 1986, Cosmic-ray measurements by neutron monitor, Geomagnetic indices).

17053 **(PB—87-114260/XAB) Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea.** Coffey, H.E. (National Geophysical Data Center, Boulder, CO (USA)). Sep 1986. 149p. NTIS, PC A07/MF A01.

Contents include: Detailed index for 1986; Data for March 1986--(Meudon carte synoptique, Solar flares, Solar radio bursts at fixed frequencies, Solar x-ray radiation from GOES satellite, Mass ejections from the sun, Active prominences and filaments); Miscellaneous data--(Interplanetary solar particles and plasma IMP 8 solar protons and alpha particles January 1984-April 1985, Geomagnetic indices May - June 1986).

17054 **(N—87-13375) Upper atmosphere of Venus: a tentative explanation of its rotation.** Boyer, C. Translated from *Astronomie (Paris) ;* 100: 77-83(Feb 1986). 6p. (NASA-TM—88505; NAS—1.15:88505). NTIS, PC A02/MF A01.

The upper atmosphere of Venus seems to revolve every 4 days, while the planet rotates in 243 days. Mariner 10 UV data on the changing positions of dark spots in the upper Venusian clouds have supported estimations of speeds ranging from 120-240 m/s. High rates of acceleration and deceleration occur on the night side, the former between -110 to -90 deg and the latter continuing to -50 deg. Arch and Y formations have been seen repeatedly between -110 to -70 deg. The highest are seen at about -90 deg and the lowest at about -30 deg. The temperature of the cloud layer at 60 km altitude is about 20 C, the pressure is nearly one earth atmosphere, and complex molecules, including O, C, H, N and S and combinations of these are present in abundance.

17055 **Invisible axion detectors.** Sikivie, P. (Univ. of Florida, Gainesville). pp 201-214 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract AS05-81ER40008.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

Axions were first proposed to solve the problem of CP invariance in QCD. Axions are a prime candidate for the constituents of the dark halos of galaxies and galaxy clusters. This paper reviews various ideas for the detection of these invisible axions. After reviewing relevant properties of axions the author describes experiments which would attempt to detect axions in the halo of our galaxy or emitted by the sun or which detect the force mediated by virtual axions.

17056 **Cosmic axion decay to photons in the microwave and infrared regions.** Weiler, T.J. (Vanderbilt Univ., Nashville, TN). pp 215-222 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract FG05-85ER40226.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

The origin and properties of cosmic axions are reviewed. A possible axion contribution to the cosmic photon gas is analyzed in terms of the axion mass, lifetime and number density. Erasure of the axion signature due to early Universe interactions of the decay photons with the electron plasma is discussed. It is concluded that the enhancement of the photon spectrum due to decay of the standard invisible axion is insignificant. A possible photon depletion due to axion formation, and possibly useful bounds on non-standard axions are mentioned.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 17050, 17051, 17052, 17122

17057 (INIS-SU—370, pp 40-43) **Investigation of super-high-energy cosmic rays (approximately 10/sup 20/eV) by means of a phase interferometer.** Gusev, G.A.; Dedenko, L.G.; Zheleznykh, I.M. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Possibility of recording of nonstationary plasma formation stage in the trace of extensive air shower at energies of 10/sup 19/-10/sup 20/ eV is shown up using the high-accuracy phase interferometer at frequencies about 100 MHz. The above mentioned interferometer scheme (5 transmitters, 20 receivers) enables, on principle, to reach the energies of 5 x 10/sup 20/ eV.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 16290, 16312, 16396, 16463, 16536, 16944, 17140, 17263

17058 **(BNL—38963) Atomic physics and synchrotron radiation: The production and accumulation of highly charged ions.** Johnson, B.M.; Meron, M.; Agagu, A.; Jones, K.W. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 21p. (CONF-861114—42). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005250.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Synchrotron radiation can be used to produce highly-charged ions, and to study photoexcitation and photoionization for ions of virtually any element in the periodic table. To date, with few exceptions, atomic physics studies have been limited to rare gases and a few metal vapors, and to photoexcitation energies in the VUV region of the electromagnetic spectrum. These limitations can now be overcome using photons produced by high-brightness synchrotron storage rings, such as the x-ray ring at the National Synchrotron Light Source (NSLS) at Brookhaven. Furthermore, calculations indicate that irradiation of an ion trap with an intense energetic photon beam will result in a viable source of highly-charged ions that can be given the name PHOBIS: the PHOton Beam Ion Source. Promising results, which encourage the wider systematic use of synchrotron radiation in atomic physics research, have been obtained in recent experiments on VUV photoemission and the production and storage of multiply-charged ions. 26 refs., 4 figs., 1 tab.

17059 **(CEA-CONF—8340) New exact inhomogeneous solutions of the Boltzmann equations.** Cornille, H. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Nov 1985. 7p. (CONF-8511237—1; SPhT—86-023). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750575.

From 266. R.C.P. meeting on inverse problems; Montpellier, France (27 Nov 1985).

We review recent results obtained for inhomogeneous distributions, solutions of $d > 1$ dimensional non linear Boltzmann equations with both Maxwell particles intermolecular forces and outside forces. We find exact solutions with a structure similar to the homogeneous Bobylev-Krook-Wu distributions. However, on the one hand, unlike the Bobylev inhomogeneous solution which corresponds to a gas in expansion, here these solutions can relax towards absolute Maxwellians. On the other hand, we construct also a class of exact inhomogeneous distributions relaxing towards different oscillating Maxwellians. Two types of external forces are handled: linear spatial forces (mainly harmonic potentials) and linear velocity forces plus uniform source term.

17060 **(CEA-CONF—8454) Population model for nickel-like gold which transitions to discard.** Busquet, M.; Bruneau, J. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Apr 1986. 9p. (CONF-8604224—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750444.

From International colloquium on X-ray lasers; Aussois, France (14 Apr 1986).

We have started studies of an extensive population model for gold ionized 49 to 52 times. We shall present in this paper a discussion on the effects of discarding low-rate transitions such as cascades, dielectronic transitions,... Their accounting for, even in a crude way, allow some understanding of typical features of gold spectra.

17061 **(CEA-CONF—8494) Influence of an external electric field on thermal collisions between circular Rydberg-state atoms and ground-state helium.** Prunele, E. de. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Apr 1986. 3p. (CONF-860435—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750573.

From Atomic and molecular physics conference; Aberdeen, Scotland (8 Apr 1986).

The influence of an external electric field on thermal collisions between a sodium atom excited in a "circular" Rydberg state and a ground-state helium atom is studied numerically within the framework of the impulse approximation. The effect of the field is determined by using parabolic wave functions for the initial and final hydrogenic atomic states. The removal of degeneracy induced by the field appears to have no significant effect for fields in the range of 0-400 V/cm.

17062 **(CEA-CONF—8530) Spectral line shapes of X-ray dipoler emission in high densities plasmas.** Lambert, D. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Jun 1986. 3p. (CONF-8606230—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750456.

From 8. international conference on spectral line shapes; Williamsburg, VA, USA (9 Jun 1986).

Published in summary form only.

17063 **(CEA-CONF—8555) Differential cross-sections of fine structure transitions in K (4P) - He, Ar collisions.** Mestdagh, J.M.; Pujo, P. de; Pascale, J.; Cuvellier, J.; Berlande, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Sep 1986. 3p. (CONF-8609187—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750576.

From 6. congress on dynamics of molecular collisions and half-collisions (MOLEC-6); Aussois, France (8 Sep 1986).

Published in summary form only.

17064 **(CEA-CONF—8556) Quantum-mechanical study of fine-structure transitions in collisions of Rb(5^2Psub(j)) with H_2 and D_2.** Pascale, F.; Rossi, F.; Baylis, W.E. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Sep 1986. 3p. (CONF-8609187—2-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750577.

From 6. congress on dynamics of molecular collisions and half-collisions (MOLEC-6); Aussois, France (8 Sep 1986).

Published in summary form only.

17065 **(CONF-860148—10) Electron ion collisions with a heavy ion cooler ring.** Schuch, R. (Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.). 1986. Contract AC05-84OR21400. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87003001.

From 2. United States/Mexico cooperative symposium on atomic and molecular physics; Cocoyoc, Mexico (8 Jan 1986).

At present several proposals and projects for building heavy ion synchrotron storage rings exist particularly in Europe. They are designed to store, accelerate, and cool heavy ions up to masses of about 240 and energies of about 500 MeV/nucleon. They are injected from existing or to be constructed accelerators. The atomic physics experiments, which are discussed here will take advantage of the electron cooling devices which provide electron-ion-collision facilities with good energy resolutions and large luminosities. The possibilities for measurements of spontaneous and laser-induced radiative recombination and dielectronic recombination in the electron cooling section are discussed.

17066 **(CONF-860845—4) Physical processes at high field strengths.** Rhodes, C.K. (Illinois Univ., Chicago (USA). Dept. of Physics). 1986. Contract AC02-83ER13137. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004732.

From 8. international conference on vacuum ultraviolet radiation physics; Lund, Sweden (4 Aug 1986).

Measurements of the radiation produced by the high field interaction with the rare gases have revealed the presence of both copious harmonic production and fluorescence. The highest harmonic observed was the seventeenth (14.6 rm) in Ne, the shortest wavelength ever produced by that means. Strong fluorescence was seen in Ar, Kr, and Xe with the shortest wavelengths observed being below 10 nm. Furthermore, radiation from inner-shell excited configurations in Xe, specifically the $4d^9 5s5p \rightarrow 4d^{10} 5s$ manifold at ~ 17.7 nm, was detected. The behaviors of the rare gases with respect to multiquantum ionization, harmonic production, and fluorescence were found to be correlated so that the materials fell into two groups, He and Ne in one and Ar, Kr, and Xe in the other. These experimental findings, in alliance with other studies on inner-shell decay processes, give evidence for a role of atomic correlations in a direct nonlinear process of inner-shell excitation. It is expected that an understanding of these high-field processes will enable the generation of stimulated emission in the x-ray range. 59 refs., 6 figs., 5 tabs.

17067 **(CONF-8608108—5) An overview of low-energy ion-atom collisions.** Lin, C.D.; Fritsch, W.; Kimura, M. (Kansas State Univ., Manhattan (USA). Dept. of Physics; Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.); Argonne National Lab., IL (USA); Rice Univ., Houston, TX (USA)). 1986. Contract W-31109-ENG-38. 12p. NTIS MF A01; 2; GPO Dep. File Number DE87004988.

From International seminar on dynamic processes of highly charged ions; Susono, Shizuoka-ken, Japan (21 Aug 1986).

For collisions between multiply charged ions (MCI) and atoms where the energy of the MCI is in the range of 0.1 to 30 keV/amu, it is adequate to treat the motion of the heavy particles classically. The problem is treated by a close-coupling expansion in terms of atomic or/and molecular orbitals with the role of ionization being neglected. 45 refs., 4 figs. (WRF)

17068 **(DOE/ER/10514—T3) Atomic physics of strongly correlated systems: Progress report, 1 August 1984 through 31 July 1985.** Lin, C.D. (Kansas State Univ., Manhattan (USA). Dept. of Physics). Mar 1985. Contract AC02-79ER10514. 7p. NTIS, PC A02. File Number DE87004407.

Brief summaries are given for (1) radial and angular correlations of two excited electrons, (2) triple-center treatment of ionization in p-H collisions, (3) electron capture from hydrogen atoms by bare ions, (4) partial capture cross sections in C^{4+} + H and C^{4+} + Li collisions, (5) the mechanism of K-shell vacancy production in near-symmetric ion-atom collisions, and (6) unified treatment of ion-atom collisions. (WRF)

17069 **(DOE/ER/13326—T2) Committee on Atomic and Molecular Sciences: Technical progress report for the period February 1, 1986-January 31, 1987.** (National Research Council, Washington, DC (USA). Committee on Atomic and Molecular Science). 15 Jul 1986. Contract FG05-85ER13326. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004850.

CAMS activities for 1986 dealt with the following areas: (1) Student Guide to AMO Science; (2) International Survey of Atomic and Molecular Science; (3) Update of the Directory of Atomic, Molecular, and Optical Scientists in the United States; (4) Workshop on VUV and Synchrotron Sources; (5) Study of the State of Atomic, Molecular, and Optical Theory; (6) Workshop on the Laser-Atomic Frontier; (7) Report on Heavy-Ion Storage Rings; (8) Review of Computer Needs in Atomic and Molecular Science.

17070 **(EFI—787(14)-85) Suppression of multiple scattering at planar channeling of negative particles.** Avakyan, H.R.; Beloshitskij, V.V.; Kumakhov, M.A. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700679.

It is shown that at planar channeling of negative particles a considerable portion of the beam undergoes depressed multiple scattering as compared to the case of nonoriented target. This anomaly of multiple scattering is presented up to large depths. 3 refs.; 1 fig.

17071 (GSI—86-31-Prepr.) **Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22.** Schoenfeldt, W.A.; Mokler, P.H.; Maor, D. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Aug 1986. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750501.

Cross sections for the electron transfer from neutral Kr atoms to highly charged Ni/sup q+/ projectiles were measured at 1.4 MeV/u collisions. Estimates on the contributions of single and double capture into the Ni-L shell and into excited states are extracted from measured cross sections for the Ni-L X-ray emission at incoming projectile L vacancies (q≧19). We find that most of the capture directly populates the Ni-L shell, in contrast to theoretical predictions for single-electron capture. The involved electrons in double transfer processes seem to be strongly correlated, and the correlation decreases with an increasing number of incoming L vacancies.

17072 (INIS-mf—10556-Vol.1, pp 47-55) **Time of flight experiments of the and H/sup +/ scattered from molecules and solid surfaces.** Toennies, J.P. (Max-Planck-Institut fuer Stroemungsforschung, Goettingen, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Experimental progress in molecular physics is illustrated with emphasis being placed on the study of interactions in three-body and many-body systems. The results are presented of four experiments using the experimental technique of time-of-flight energy loss spectroscopy of atomic or molecular particles at interactions. The experiments are in principle analogous with scattering experiments in nuclear physics. The elastic and inelastic scattering was measured of 20 MeV /sup 4/He atoms by molecules of N/sub 2/, O/sub 2/, CO, CH/sub 4/, and on the surface of noble metals, of proton beams with energy ranging between 10 and 20 eV on a CH/sub 4/ molecular beam, and of HD molecules with energies of up to 30 meV on the surface of gold. Molecular spectroscopic data were obtained with high resolution such as may be compared with model calculations. (S.P.).

17073 (INIS-mf—10556-Vol.1, pp 323-328) **Experimental studies on dissociative charge exchange.** Los, J.; Bruijn, D.P. de. (FOM-Instituut voor Atoom-en Molecuulfysica, Amsterdam, Netherlands). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Transitions to continuum states are discussed focusing on dissociative charge exchange. An experimental method is described which allows detailed measurements on this process. Experiments are shown on the dissociative charge exchange of H/sub 2//sup +/ and on photodissociation of metastable H/sub 2/ formed in charge exchange collisions.

17074 (INIS-mf—10556-Vol.1, pp 329-335) **Dissociation dynamics of van der Waals molecules.** Beswick, J.A. (Laboratoire pour l'Utilisation du Rayonnement Electromagnetique, LURE, Paris-11 Univ., 91 - Orsay, France). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Energy flow patterns of excited van der Waals molecules are reviewed. The most recent techniques to study these molecules rest on the use of supersonic beams and laser excitation. The experiments do not only probe the structure and energy state of the complex but also provide information on the intramolecular energy flow and relaxation. A most interesting feature of excited-state intramolecular dynamics in such systems is the breaking of the weak van der Waals bond. This new class of photochemical fragmentation via internal excitation of van der Waals molecules provides an unambiguous example for vibrational and/or rotational predissociation in molecular physics.

17075 (INIS-mf—10556-Vol.1, pp 336-340) **Dissociative electron attachment.** Hall, R.I. (Paris-6 Univ., 75, France). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Electron-molecule collisions are studied in which molecules dissociate by dissociative attachment of electrons to one of the fragments. The formation of negative ions is a resonant process. Fragment energy distribution and angular distribution of negative ion fragments in collisions with biatomic and triatomic molecules are outlined. The physics is described of the process of dissociative attachment of the electron. (S.P.).

17076 (INIS-mf—10556-Vol.1, pp 341-346) **Rotational energy transfer in molecule-molecule and molecule-surface collisions.** Schinke, R. (Max-Planck-Institut fuer Stroemungsforschung, Goettingen, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Inelastic scattering of molecules in collisions with molecules or surfaces is studied. Attention is devoted to the structure of the differential cross section connected with rotational transitions, the so-called rotational rainbow effect. The relationship is illustrated between the rotational rainbow effect and the interaction potential. A detailed analysis is made of the following examples of collisions: Ne-Na/sub 2/, H/sub 2/-CO, NO-Ag(111), NO-Ar. (S.P.).

17077 (INIS-mf—10556-Vol.1, pp 347-352) **Collisional dynamics of low energy charge transfer processes.** Herman, Z. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyzikalni Chemie a Elektrochemie J. Heyrovskeho). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The study concentrates on asymmetric charge transfer in ion-molecule scattering processes of the type A/sup +/+BC->A+BC/sup +/ and BC/sup +/+A->BC+A/sup +/ at energies in the eV range. Also mentioned are the latest results of the study of single-charge transfer in an atomic system of the type A/sup ++/+B->A/sup +/+B/sup +/. The experimental methods used are presented as are experimental results illustrating each type of collision process. (S.P.).

17078 (INIS-mf—10556-Vol.1, pp 353) **Molecular beam studies and quantum chemistry of elementary photochemical processes: electronic to vibrational energy transfer.** Hertel, I.V. (Freie Univ. Berlin, Germany, F.R. Inst. fuer Molekuelphysik). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

17079 (INIS-mf—10556-Vol.1, pp 372-373) **Asymmetric scattering in thermal collisions of alkali (/sup 2/P/sub 3/2/)-atoms with rare gas atoms: Na(3/sup 2/P/sub 3/2/) and K(4/sup 2/P/sub 3/2/) with Ne, Ar and Kr.** Dueren, R.; Hasselbrink, E. (Max-Planck-Institut fuer Stroemungsforschung, Goettingen, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The measurement is discussed of the total differential cross section, i.e., without final state analysis, of the scattering of excited alkali atoms Na(3/sup 2/P/sub 3/2/) and K(4/sup 2/P/sub 3/2/) by rare gas atoms (Ne, Ar, Kr) in crossing atomic beams. A laser beam was used for excitation. The initial states with j,m/sub j/=3/2,+3/2 and 3/2,-3/2 were selected by the choice of circular light polarization. An asymmetry was observed in the scattered intensity. The experimental results are compared with theoretical calculations. (S.P.).

17080 **(IPNO-DRE—85-21) MeV heavy ion induced desorption from insulating films as function of projectile velocity.** Becker, O.; Wien, K.; Della Negra, S.; Le Beyec, Y. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1985. 44p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750732.

The work presented here is focussed on the velocity dependence of the secondary ion yields. The experiments were performed at the ALICE accelerator in Orsay, where primary ion velocities from v=0.2 to 3.0 cm/ns were available, and at a parasitic beam (v<1.6 cm/ns) of the UNILAC-GSI in Darmstadt, where beams up to Uranium could be used. This velocity range covers the most important part of the yield curves and is - as outlined in the following - a critical test for theoretical descriptions.

17081 **(LBL—22282) Ionization and charge transfer in high-energy ion-atom collisions.** Schlachter, A.S.; Berkner, K.H.; Stearns, J.W.; Schmidt-Boecking, H.; Kelbch, S.; Ullrich, J.; Hagmann, S.; Richard, P.; Stockli, M.P.; Graham, W.G. (Lawrence Berkeley Lab., CA (USA); Frankfurt Univ. (Germany, F.R.). Inst. fuer Kernphysik; Kansas State Univ., Manhattan (USA). Dept. of Physics; Ulster Univ., Coleraine (UK). Dept. of Physics; Western Michigan Univ., Kalamazoo (USA). Dept. of Physics; Giessen Univ. (Germany, F.R.). Inst. fuer Kernphysik). Nov 1986. Contract AC03-76SF00098;AC02-83ER13116. 20p. (CONF-861114—37). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003539.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

Electron capture and loss by fast highly charged ions in a gas target, and ionization of the target by passage of the fast projectile beam, are fundamental processes in atomic physics. These processes, along with excitation, can be experimentally studied separately ("singles") or together ("coincidence"). This paper is a review of recent results on singles measurements for electron capture and loss and for target ionization, for velocities which are generally high relative to the active electron, including recent ionization measurements for a nearly relativistic projectile. 11 refs., 6 figs.

17082 **(LBL—22418) Photoionization of atoms and small molecules using synchrotron radiation.** Ferrett, T.A. (California Univ., Berkeley (USA)). Nov 1986. Contract AC03-76SF00098. 269p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE87004600.

The combination of synchrotron radiation and time-of-flight electron spectroscopy has been used to study the photoionization dynamics of atoms (Li) and small molecules (SF_6, SiF_4, and SO_2). Partial cross sections and angular distribution asymmetry parameters have been measured for Auger electrons and photoelectrons as functions of photon energy. Emphasis is on the basic understanding of electron correlation and resonant effects as manifested in the photoemission spectra for these systems. 254 refs., 46 figs., 10 tabs.

17083 **(UCRL—95853) Review of progress in the theory of volume production.** Hiskes, J.R. (Lawrence Livermore National Lab., CA (USA)). 24 Oct 1986. Contract W-7405-ENG-48. 14p. (CONF-8610115—10). NTIS, PC A02. File Number DE87004360.

From 4. international symposium on the production and neutralization of negative ions and beams; Upton, NY, USA (27 Oct 1986).

With the demonstration of large current densities extracted from hydrogen-discharge-type negative ion sources there has been a new emphasis directed toward the further development of these volume-type sources. Along with this emphasis has been a rapid increase in our understanding of the underlying atomic processes that occur in hydrogen-negative-ion discharges, together with a rapid evolution of the geometric configuration of these ion sources. An account of the development of the atomic processes in negative hydrogen discharges has been given in a recent review. Here we shall emphasize these atomic developments as they bear on the tandem high-density ion-source configuration. 32 refs., 10 figs.

17084 **Scalar magnetic (e/sup +/e/sup -/) resonance as possible source of an anomalous e/sup +/ peak in heavy-ion collisions.** Wong Cheukyin; Becker, R.L. (Oak Ridge National Lab., TN, USA). *Physics Letters [Section] B;* 182: No. 3/4, 251-255(25 Dec 1986). Contract AC05-84OR21400.

The possibility of (e/sup +/e/sup -/) resonances arising from strong magnetic interactions at short distances is explored as a possible source of the anomalous positron peak in heavy-ion collisions. With a relativistic two-body equation and a model interaction, a scalar /sup 3/P 0/sup ++/ resonance (j=0, 1=1, S=1, P=1 and C=1) with a mass of 1.579 MeV is found. Its two-body decay into an (e/sup +/e/sup -/) pair has a mean life of 4.2 x 10/sup -19/ s and produces a positron and an electron each with a kinetic energy of 279 keV.

17085 **Atomic physics 9.** Van Dyck, R.S. Jr.; Fortson, E.N. (eds.). Singapore, Singapore; World Scientific Publishing Co. Pte. Ltd. (1984). 565p. (CONF-840786—). World Scientific Publishing Co. Pte. Ltd., P.O. Box 128, Farrer Road, Singapore 9128. File Number TI87004225. Contract FG06-84ER13280.

From 9. international conference on atomic physics; Seattle, WA, USA (23 Jul 1984).

Individual papers are catalogued separately. (WRF)

6404 Fluid Physics

17086 **(BARC—1246) Two dimensional analysis for magnetic flux distribution in electromagnet used for MHD applications.** (Bhabha Atomic Research Centre, Bombay (India)). 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701246.

Magnetic flux densities in air and iron region of iron core MHD electromagnet, are calculated based on concept of magnetic vector potential. Numerical solution to the problem is obtained by converting partial differential equations into finite difference form with simplifying assumptions. A computer progrm is developed, giving solution by finite difference method. Over-relaxation technique based on Stoke's theorem is applied. Magnetic induction along the transverse axis of the magnet and plot for magnetic induction lines for current = 2420 A is presented. 9 refs., 7 figures.

17087 **(DOE/ER/72012—T4) CALTECH: DOE program on numerical analysis, computing and fundamental studies in fluid mechanics: Summary report No. 12, April 1, 1986-March 31, 1987.** (California Inst. of Tech., Pasadena (USA)). 1987. Contract AS03-76ER72012. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004914.

Brief summaries are given for the following areas of research: (1) vortex dynamics and vortical flows, (2) Hele-Shaw fingering, (3) numerical methods for stiff differential equations, (4) pattern formation in solidifying systems, (5) path instability in rising bubbles, (6) multigrid solvers for partial differential equations, and (7) software development. (WRF)

17088 (INIS-mf—10556-Vol.1, pp 133-137) **Astrophysical dynamo.** Ruzmajkin, A.A. (AN SSSR, Moscow. Inst. Prikladnoj Matematiki). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The principle of magnetic field amplification by fluid motion is explained and the slow and fast astrophysical dynamo concepts are discussed, the crucial role of the value of magnetic diffusivity being emphasized. The general kinematic dynamo theorem for random flows is formulated and some of its nonlinear aspects are pointed out. Three important astrophysical applications are briefly mentioned, namely the theory of stellar cycles, magnetic field generation in thin galactic discs, and the structure of accretion discs around black holes in binary star systems. (J.U.).

17089 (INIS-mf—10556-Vol.1, pp 138-143) **Magnetohydrodynamic turbulence.** Pouquet, A. (Observatoire de Nice, 06, France). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Various approaches to the nonlinearities of MHD equations describing the turbulent flow of a conducting fluid are reviewed. The relative strength of nonlinear terms in the MHD equations is measured by kinetic and magnetic Reynolds numbers. In astrophysical flows characterized by very large Reynolds numbers many degrees of freedom are excited, which results in a cascade of excitations from a large to small scale. The restriction of the problem to the case where only a few degrees of freedom are kept, is desirable. Generally, for a full description of various cascades, statistical methods such as closures of renormalization groups and numerical simulation must be applied. (J.U.).

17090 (INIS-mf—10556-Vol.1, pp 123-128) **Magnetoconvection.** Galloway, D.J. (Max-Planck-Institut fuer Physik und Astrophysik, Garching, Germany, F.R. Inst. fuer Astrophysik). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Theoretical attempts to understand the interaction between convection and magnetic fields are summarized, excluding cases where the flow is turbulent or where rotational effects are also important. Theories and computations are grouped into kinematic, Boussinesq, or fully compressible categories, and are contrasted in terms of the amount of physics they contain and of the number of dimensions represented.

17091 (INIS-mf—10556-Vol.1, pp 114-120) **Spin-polarized hydrogen: new limitations on high density.** Silvera, I.F. (Harvard Univ., Cambridge, MA, USA. Dept. of Physics). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The prime goal in the study of spin-polarized hydrogen has been to observe properties of quantum degeneracy in this Bose gas, in particular Bose-Einstein condensation. This requires high densities and/or low temperatures. In four years time, densities have been increased by 4 1/2 orders of magnitude. The techniques, problems and prospects are discussed.

17092 (INIS-mf—10556-Vol.1, pp 101-113) **Quantized vortices in rotating superfluid /sup 3/He.** Krusius, M. (Helsinki Univ. of Technology, Otaniemi, Finland). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

First measurements on quantized vortices in rotating superfluid /sup 3/He have been conducted during the last three years with a rotating nuclear demagnetization cryostat capable of cooling liquid /sup 3/He below 0.5 mK while rotating up to 20 rev/min. The experiments comprised NMR investigations of vortex textures and hydrodynamic measurements on persistent superflow in a toroidal flow channel. A remarkable variety of unexpectd phenomena were discovered which illuminate the structure and topology of quantized vortices in anisotropic superfluids.

17093 **Hamiltonian differencing of fluid dynamics.** Holm, D.D.; Kupershmidt, B.A.; Levermore, C.D. (Los Alamos National Lab., NM). *Advances in Applied Mathematics;* 6: 52-84(1985).

By analyzing the Hamiltonian structures of several representations of continuous Lagrangian fluid dynamics, a universal Hamiltonian form is developed which unifies those structures and applies both to the continuous and spatially discrete cases. Then the universal Hamiltonian form is used as a template for generating numerical differencing schemes which retain the underlying Hamiltonian structure of the continuous theory. Examples are discussed of these spatial differencing schemes for the Euler equations in one, two, and three dimensions. In one dimension, the nondissipative part of the von Neumann-Richtmeyer scheme is recovered as a special case. 33 references.

6450 High Energy Physics

REFER ALSO TO CITATION(S) 16160, 16944

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 16596, 17128, 17134, 17179

17094 **(ANL-HEP-CP—86-107) Nucleon decay experiments: status and prospects.** Ayres, D.S.; Beier, E.W.; D'Ettorre Piazzoli, B.; Ernwein, J.; Gaisser, T.K.; Seidel, S.; Sulak, L.R. (Argonne National Lab., IL (USA); Pennsylvania Univ., Philadelphia (USA); Turin Univ. (Italy); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France); Bartol Research Foundation of the Franklin Inst., Newark, DE (USA); Michigan Univ., Ann Arbor (USA)). 1986. Contract W-31109-ENG-38. 8p. (CONF-8606215—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87001561.

From Summer study on the physics of the superconducting super collider ↑; 0.

We survey the current status and future prospects of experiments to search for nucleon decay. Results from current experiments are summarized, and the background rejection capabilities of various techniques are described. We discuss the prospects for improved sensitivity in the new experiments that are now coming into operation, and the opportunities for the next generation of detectors. 33 refs., 2 figs., 4 tabs.

17095 **(ANL-HEP-CP—86-133) Properties of gluon jets.** Sugano, K. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31-109-ENG-38. 63p. (CONF-860943—2). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87004842.

From 6. physics in collision; Chicago, IL, USA (3 Sep 1986).

The properties of gluon jets are reviewed from an experimental point of view. The measured characteristics are compared to theoretical expectations. Although neither data nor models for the gluon jets are in the mature stage, there are remarkable agreements and also intriguing disagreements between experiment and theory. Since much interesting data have begun to emerge from various experiments and the properties of gluon jets are deeply rooted in the basic structure of non-Abelian gauge theory, the study of gluon jets casts further light on our understanding of QCD. Finally, the future prospects are discussed.

17096 **(BNL—39168) Experimental results on spin physics at the AGS.** Makdisi, Y.I. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 6p. (CONF-8609151—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005257.

From 7. international symposium on high energy spin physics; Protvino, USSR (22 Sep 1986).

The AGS ran with polarized protons towards the end of 1985 and through the first two months of 1986. This comprised commissioning periods interleaved with two runs for physics at 13.5 GeV/c with beam polarization of 50 to 60%, and 18.5 GeV/c with an average beam polarization of 40%. Later, the AGS polarized beam reached peak energy of 22 GeV/c and polarization of 46%. This article describes the various spin related experimental efforts since the VI Symposium at Marseille. These will be grouped into those using unpolarized beams and the rest are the polarized proton beam users. Afterwards the future of the program is described as extensions of current experiments in addition to other measurements that are yet to be proposed.

17097 (CERN—86-07) Evolution of weak interactions. Lee, T.D. (European Organization for Nuclear Research, Geneva (Switzerland)). 16 Sep 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700668.

Talk given at the symposium dedicated to Jack Steinberger, at CERN, 16 May 1986.

A history of the study of weak interactions is presented, together with some personal recollections of the important contributions made by Jack Steinberger.

17098 (DOE/ER/03244—134) Hyperon-antihyperon production studies near threshold at LEAR. Hamann, N. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics; Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). 1985. Contract AC02-76ER03244. 6p. (CONF-8506162—5). NTIS, PC A02. File Number DE87003929.

From Symposium on medium energy nucleon and antinucleon scattering; Bad Honnef, F.R. Germany (18 Jun 1985).

Aspects of proton-antiproton interactions above the threshold for lambda-antilambda production are studied at LEAR. Measured quantities include total and differential cross sections as well as final state polarizations and hyperon-antihyperon spin correlations for this reaction at 1508 and 1477 MeV/c antiproton beam momentum.

17099 (DOE/ER/10690—7) Participation in the ARGUS experiment at the DORIS Collider at Desy, Hamburg, Germany and participation in the AMY experiment at the TRISTAN Collider in Tsukuba, Japan: 1986 progress report. Darden, C. (South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy). Jan 1987. Contract AS09-80ER10690. 11p. NTIS, PC A02. File Number DE87005171.

Progress is reported on the AMY and ARGUS detectors, as well as plans for the next funding period. The AMY detector is reported as well on the way to completion, but not yet ready to take data. The ARGUS detector is reported to have completed its fourth year of operation. Some upsilon 1S decay data are discussed. 37 refs. (LEW)

17100 (DOE/ER/40257—001) Non-accelerator particle physics: Progress report for period February 1, 1986-January 31, 1987. Steinberg, R.I. (Drexel Univ., Philadelphia, PA (USA). Dept. of Physics and Atmospheric Science). Jan 1987. Contract AC02-86ER40257. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004418.

The goals of this research are the experimental testing of fundamental theories of physics such as grand unification and the exploration of cosmic phenomena through the techniques of particle physics. We are currently participating in construction of the MACRO detector, an underground instrument which will have an acceptance of 12,000 m^2sr, and which will attempt to perform a definitive search for magnetic monopoles using excitation-ionization methods. Other major objectives of the MARCO experiment will be to search for astrophysical high energy neutrinos expected to be emitted by such objects as Vela X-1 and LMC X-4 and to search for low energy neutrino bursts from gravitational stellar collapse. We have developed a high transparency liquid scintillator suitable for use in the 12-meter-long MACRO detector boxes. We are also currently engaged in: (1) further improving the performance of this scintillator in order to maximize the sensitivity of the MACRO detector to lightly ionizing particles and to further improve the stability and transparency of the scintillator; (2) preparing the techniques necessary for full scale production of the 750 tons of liquid scintillator needed for MACRO; (3) planning and development of the on-line data acquisition system and off-line data analysis for MACRO.

17101 (EFI—782(9)-85) Measurement of the polarization of cumulative protons in γA -> pX reaction. Avakyan, R.O.; Avakyan, E.O.; Avetisyan, A.Eh. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700677.

The polarization of cumulative protons in γA -> px reaction is measured in the range of proton energy (190 + 270) MeV for C, Cu, Sn, Pb nuclei. The measured polarization is practically independent of the energy of protons and the atomic number of nuclei. 11 refs.; 4 figs.; 1 tab.

17102 (EFI—796(23)-85) On the growth of hadronic photoabsorption cross-section. Bayatyan, G.L.; Margaryan, A.J. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700686.

Energy dependence of total hadronic photoabsorption cross section is discussed in connection with the hypothesis about gluonic nature of cross-section growth. 6 refs.; 1 fig.

17103 (IFVE-OEF—85-32) Experiment to study the gluon interactions and glueball production in the central region of hadron collisions at UNK energies (2-3 TEV). Prokoshkin, Yu.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700710.

The experiment in the UNK beam (2-3 TeV) is discussed in which glueballs are separated from the background of quark meson states. The glueball signal is enchanced both in the production reaction (in the central collision region, Xsub(F), where Xsub(F) is the Feynman variable) and in the decay process (into pseudoscalar mesons and further on into photons, including (gg)->P/sub 1/P/sub 2/->kγ, 4 <= k <= 20). The main features of the experimental set-up are considered as well as the pecularities of detecting multiphoton states which are produced in glueball decays with the help of the hodoscope spectrometer GAMS. 23 refs.; 11 figs.

17104 (IFVE-OEIPK—85-108) Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c. Azhinenko, I.V.; Kurnosenko, A.I.; Uvarov, V.A.; Shlyapnikov, P.V.; Garuchava, Z.Sh.; Shoshiashvili, Sh.S.; Vol'f, E.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700714.

Submitted to the journal Sov. J. Nucl. Phys. .

Experimental data are presented on inclusive production of the Λ hyperons and slow protons (with psub(LAB) < 1,2 GeV/c) in the K/sup +/p -> Λ + p + X reaction at 32 GeV/c. 13 refs.; 3 figs.; 2 tabs.

17105 (IFVE-ONF—85-107) Study on the inclusive neutrino (antineutrino) interactions with nuclei at 3-30 GeV. Ammosov, V.V.; Baranov, D.S.; Bugorskij, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700719.

Submitted to the journal Zeit. Phys. C.

The results on studying inclusive ν(anti ν)A charged current interactions obtained in the SCAT bubble chamber experiment are presented. The differential cross sections and nucleon structure function have been analyzed. The results are compared with QCD and predictions. 25 refs.; 8 figs.; 1 tab.

17106 (INIS-mf—10556-Vol.1, pp 217-222) Solar neutrino experiments. Hampel, W. (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The current status of solar neutrino research is reviewed. Updated results from the Brookhaven Chlorine Experiment are presented and compared with the expectation from the Standard Solar Model. The present status of the Gallium Experiment is described and the response of this detector to different possible explanations for the discrepancy resulting from the Cl experiment is discussed. The status is reported of some of the other solar neutrino detectors on which work is in progress.

17107 (INIS-mf—10556-Vol.1, pp 229) **Lepton number non-conservation and double beta decay.** Fiorini, E. (Milan Univ., Italy. Ist. di Fisica). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

17108 (INIS-mf—10556-Vol.1, pp 230-235) **Beam dump neutrino experiments.** Perez, P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette, France). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The results are presented of beam dump neutrino experiments carried out in CERN and FNAL. The values are presented of the ratios ν-bar/sub μ//ν/sub μ/ and (ν/sub e/+ν-bar/sub e/)/(ν/sub μ/+ν-bar/sub μ/). The beam dump neutrino experiments have established a new source of neutrinos. They are also a tool for searching new classes of particles kindly offered by the theorists. (Z.J.).

17109 (INIS-mf—10556-Vol.1, pp 236-245) **Neutrino physics at future colliders.** Rujula De, A. (European Organization for Nuclear Research, Geneva, Switzerland). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The prospects are assessed of neutrino physics at future colliders, namely at the American SCS and the European LHC. The main characteristics (total flux and average energy) are derived of prompt lepton beams and the expected event rates at a hypothetical standard detector are computed. The neutrino beams are compared produced in the collider mode with the neutrino beams from a beam dump and with future ep facilities. An estimate is made of charm production cross sections at TeV energies. (Z.J.).

17110 (INIS-mf—10556-Vol.1, pp 291-298) **Jets in e/sup +/-e/sup -/ collisions.** Haissinski, J. (Paris-11 Univ., 91 - Orsay, France. Lab. de l'Accelerateur Lineaire). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

It is pointed out that hadron jets observed in e/sup +/-e/sup -/collisions have a deep origin. They reveal the emission of energetic primary partons and subsequent confinement effects which prevent colour charges from separating at large distances. The study of these jets has allowed the determination of some important parton properties such as the spin. All observations concerning jet morphology and the event shape evolution with CMS energy are well described by perturbation quantum chromodynamics. (Z.J.).

17111 (INIS-mf—10556-Vol.1, pp 309-315) **Quarkonia.** Conforto, G. (INFN, Firenze, Italy). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The term quarkonium indicates the system formed by a quark and its antiquark. The study of quarkonia aims at a comprehensive understanding of the interquark force. The processes of formation, cascade decays and annihilations of quarkonia are investigated. (Z.J.).

17112 **(INS-TEC—22) Data compilation of single pion photoproduction below 2 GeV.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). 5 Sep 1985. 105p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87701316.

An updated data compilation on single pion photoproduction experiments below 2 GeV is presented. This compilation is mainly purposed to use the determination of photocoupling of the nucleon resonances. This data bank includes not only the data of single pion photoproduction from nucleon and deuteron but also the proton Compton scattering (γp -> γp) and the inverse process of the γn -> π/sup -/p (π/sup -/p -> γn). More than 8 experiments are performed from the previous publication. In this publication, 20 experiments for coherent π/sup 0/ production off deuteron are newly presented. The INS computer is replaced to FACOM M-300 series at November 1984. The compiled data are stored on the INS central computer (FACOM M-380) for direct use of this data bank and on a magnetic tape with the standard label for other laboratories. The FACOM computer is compatible with an IBM 370-series or IBM 303X- or 308X-series machines. Then the compiled data are able to use at any laboratories having an IBM or an IBM compatible machines. The data on the magnetic tape are available on request.

17113 **(INS-TH—161) Data compilation of single pion photoproduction below 2 GeV.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Sep 1984. 69p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87701317.

An updated data compilation on single pion photoproduction experiment below 2 GeV is presented. This data bank includes not only the data of single pion photoproduction processes but also those of the proton Compton scattering (γp -> γp) and the inverse process of the γn -> π/sup -/p (π/sup -/p -> γn). The number of total data points are 6240 for γp -> π/sup +/n, 5715 for γp -> π/sup 0/p, 2835 for γn -> π/sup -/p, 177 for γn -> π/sup 0/n, 669 for γp -> γp, and 112 for π/sup -/p -> γn processes. The compiled data are stored in the central computer (FACOM M-380R) of the Institute of Nuclear Study, University of Tokyo, for direct use of this data bank and on magnetic tapes with the standard label for other laboratories. The FACOM computer is compatible with an IBM 370 series or IBM 303X or 308X series machines. The data on the magnetic tapes are available on request. (Kato, T.).

17114 **(ITEP—115(1985)) Experimental comparison of EMC effect in the anti νn and anti νp interactions in neon nucleus.** Asratyan, A.E.; Efremenko, V.I.; Fedotov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701322.

In the framework of the method used to separate the antiν and antiνp interactions in the neon nucleus, a strong distinction of the quantity Rsub(Ne)(x)=(dσsup(antiνn)/dx)/(dσsup(antiνp)/dx) measured in this anti νNe experiment from the analogous quantity Rsub(D)(x) obtained earlier in a deuterium experimentis found. This difference can be attributed to the difference between the magnitudes of the EMC effect in the anti νn and anti νp scattering. 14 refs.; 2 figs.

17115 **(ITEP—187(1984)) Anti νn and anti νp interactions in neon nucleus: total cross section ratio and quark-parton analysis.** Asratyan, A.E.; Efremenko, V.I.; Fedotov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701323.

About 7 thousand events of the charged-current anti νn and anti νp scattering in the neon nuclei at the antineutrino energies 10 - 20 GeV are studied in the experiment with the Fermilab 15-ft. bubble chamber. the total cross section ratio Rsigmasub(antiν)sigmasub(antiνp) is independent of the energy and is equal to R=0.48 +- 0.03(+0.03-0.00) on the average. Extracted in the framework of the quark parton model are the momentum distributions xu(x), xd(x), x[anti u(x) + anti s(x)], x[anti d(x) + anti s(x)] of the (anti)-quarks in the bound proton. The results are compared with the free nucleon data from deuterium and hydrogen experiments. 28 refs.; 8 figs.

17116 **(JINR-R—1-85-220) Λ hyperon and K/sup 0/ meson production in Cp and CC interactions at 4.2 GeV/c per nucleon.** Armutlijskij, D.A.; Bogdanovich, E.; Gasparyan, A.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700788.

Submitted to the journal Sov. J. Nucl. Phys. .

This paper is devoted to the production of Λ hyperons and Ksub(s)sup(0)-mesons in Cp, CC interactions and CC multinucleon interactions. The mean multiplicities and also inclusive cross sections of Λ- and Ksub(s)sup(0)-production in the interactions under study have been determined. On the average a larger multiplicity of charged particles is observed in CC-interactions with the production of Λ- and K-particles as compared to all inelastic CC-interactions: <nsub(+-)>Λ, K/sup 0/ approximately 1.3 < nsub(+-) >sub(CC)sup(in). Such an effect is not discovered for multinucleon CC-interactions. The momentum and angular distributions for Λ- and Ksub(s)sup(0)-particles are presented. 16 refs.; 9 figs.; 6 tabs.

17117 **(JINR-R—1-85-854) Analysis of elastic scattering in anti pp interactions at 22.4 GeV/c.** Batyunya, E.V.; Boguslavskij, I.V.; Bruntsko, D. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700791.

Results are presented on measuring the anti pp elastic scattering differential cross section at 22.4 GeV/c over a region of 0.05 < chemical bondtchemical bond < 0.95 GeV/sup 2/. The results have been obtained from pictures of the HBC "Ludmila". The total elastic cross section σsub(el)=9.0 +- 0.3 mb and the slope parameter b(s, t=0)=13.1 +- 0.8 GeVsup(-2) have been found from the data approximated by a quadratic exponential function. The results are compared with the data at similar energies. 23 refs.

17118 **(JINR-R—1-85-948) A-dependence of production cross section of the Nsub(PHI) narrow baryon resonance.** Aleev, A.N.; Aref'ev, V.A.; Balandin, V.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700792.

Submitted to the journal Sov. J. Nucl. Phys. .

A narrow baryon resonance Nsub(PHI) decaying into Σ/sup -/(1385)K/sup +/ has been detected in an experiment performed by means of B1S spectrometer in a neutron beam of the Serpukhov accelerator. Multichannel threshold gas Cherenkov counters, being a part of the spectrometer composition, were used for positively charged kaon identification in resonance selection. The spectrometer exposition in neutron beam was performed at 3 targets (carbon, aluminium and copper). This allowed one to determine A-dependence of Nsub(PHI) production cross section, which is described by a power law sigma approximately Asup(α), at α=(0.6 +- 0.3). Nsub(PHI) production cross section times the branching ratio over the observed channel is equal to (0.26 +- 0.20) μb per nucleon. 9 refs.; 7 figs.; 1 tab.

17119 **(NBI-HE—84-42) Fragmentation of jets produced in hard p anti p collisions at the ISR.** Botner, O. (Niels Bohr Inst., Copenhagen (Denmark)). 16 Aug 1984. 11p. (CONF-840757—39). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750534.

From 22. international conference on high energy physics; Leipzig, German D.R. (19 Jul 1984).

Among the highlights at the 21. ICHEP in Paris (1982) were results from the ISR and the CERN p anti p collider showing the emergence of jets in events triggered on large transverse energy (ET) deposition in a calorimeter. Measurements of the inclusive jet cross-sections and studies of event properties followed, both at ISR energies (√s=45 and 63 GeV) and at the collider, √s=540 GeV. Having proven that jets dominate the event structure at sufficiently high ET, the AFS collaboration has used a 2-JET trigger, requiring large ET in two non-overlapping regions of the calorimeter, to enhance the sample of jet events. In the following we present an analysis of jet fragmentation properties based on this data sample.

17120 **(TRI-PP—86-104) Review of results from TRIUMF.** Kitching, P. (TRIUMF, Vancouver, British Columbia (Canada)). Oct 1986. 5p. NTIS (US Sales Only), PC A02. File Number DE87900324.

The high energy physics experiments at TRIUMF are briefly discussed, including: measurement of charge symmetry breaking in the n-p system; test of time reversal invariance in the p-p system; measurement of R/sub t//D/sub t/ in n-p scattering; measurement of cross sections and A/sub y/ for interactions of polarized protons and neutrons; pion-deuteron elastic scattering; and planned experiments with an optically pumped polarized ion source. (LEW)

17121 **Study of gluon scattering and gluon fragmentation in high P/sub T/ interactions at the ISR.** Breakstone, A.; Crawley, H.B.; Firestone, A.; Gorbics, M.; Isenhower, D.; Lamsa, J.W.; Meyer, W.T.; Campanini, R.; Cuffiani, M.; Deninno, M.M. (Ames Lab., IA, USA; Iowa State Univ. of Science and Technology, Ames, USA. Dept. of Physics). *Zeitschrift fuer Physik [Sektion] C: Particles and Fields;* 33: No. 4, 475-481(Feb 1987). Contract W-7405-ENG-82;AC03-76SF00098.

Gluon scattering processes are studied in hadronic high p/sub T/ events using data obtained with the Split Field Magnet detector (SFM) at the CERN ISR. The experimental set-up allowed the scanning of a wide range of parton energies and scattering angles. It is shown that for positive pions as trigger particles, the parton composition of the recoil jet is correlated with the polar angle and transverse momentum of the triggering pion. Over the kinematical region studied, the recoil jet originates predominantly from scattered gluons, with an increasing prevalence of the gluon component towards forward triggering angles. The variation of the momentum structure of the recoil jet with the trigger angle indicates that the fragmentation function of gluons is softer than that of quarks.

17122 **Production of activation products in space-craft components by protons in low earth orbit.** Normand, E.; Johnson, M.L. (Boeing Aerospace). *Transactions of the American Nuclear Society;* 53: 412-413(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

A spacecraft orbiting the Earth through trapped radiation belts will be subject to an induced effect as well as to the direct irradiation by the protons and electrons of the trapped belts. This induced effect is activation of the spacecraft materials by the trapped belt protons. This activation will produce many radioisotopes having half-lives ranging from seconds to millions of years, and emitting various types of radiation. Of primary concern are radioisotopes that emit gamma rays and have half-lives of several years or less. Cross-section data sets are currently being compiled for proton-induced activation products by the Los Alamos National Laboratory. Despite uncertainties in cross-section data, it is instructive to illustrate the magnitude of activation levels and the resulting dose rates calculated in an approximate manner. A number of simplifying assumptions are made.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 16953, 16954, 17095, 17112, 17187, 17188, 17288

17123 **(ANL-HEP-CP—86-130) Tests of QCD in high energy spin reactions.** Lipkin, H.J. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 16p. (CONF-8609151—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004841.

From 7. international symposium on high energy spin physics; Protvino, USSR (22 Sep 1986).

Spin physics in the quark model is discussed, starting with the prediction of the ratio of the proton and neutron magnetic moments. Other experimental tests of the spin-isospin structure of baryon wave functions are considered, including interactions of pions on polarized protons involving spin flip. Also considered are polarization experiments in nucleon-nucleon scattering to test the different mechanisms suggested by QCD for high transverse momentum transfer in hadron-hadron scattering. (LEW)

17124 **(ANL-HEP-CP—86-134) Bottom quark production at the SSC [Superconducting Super Collider].** Berger, E.L.; Collins, J.C.; Soper, D.E. (Argonne National Lab., IL (USA); Illinois Inst. of Tech., Chicago (USA). Dept. of Physics; Oregon Univ., Eugene (USA). Inst. of Theoretical Physics). 8 Dec 1986. Contract W-31-109-ENG-38. 12p. (CONF-8606215—31). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004967.

From Summer study on the physics of the superconducting super collider ↑; ().

We present predictions for the rapidity and transverse momentum distributions for inclusive production of bottom quarks at SSC energies, pp → bX. Our computations are based on the simplest, lowest-order QCD mechanisms. To estimate uncertainties, we use three different choices for structure functions, G(x,Q), as well as different choices for the evolution scale Q.

17125 **(BARC—1260) Heavy ion collisions, the quark-gluon plasma and antinucleon annihilation.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701253.

Studies in high energy physics have indicated that nucleon and mesons are composed of quarks confined in bags by the strong colours mediated by gluons. It is reasonably expected that at suitably high baryon density and temperature of the nucleus, these bags of nucleon and mesons fuse into a big bag of quarks or gluons i.e. hadronic matter undergoes transition to a quark-gluon phase. Two techniques to achieve this transition in a laboratory are: (1) collision of two heavy nuclei, and (2) annihilation of antinucleons and antinuclei in nuclear matter. Theoretical studies as well as experimental studies associated with the transition to quark-gluon phase are reviewed. 51 refs., 12 figures, 3 tables.

17126 **(BNL—39062) The fifth force.** Fischbach, E.; Sudarsky, D.; Szafer, A.; Talmadge, C.; Aronson, S.H. (Purdue Univ., Lafayette, IN (USA). Dept. of Physics; Washington Univ., Seattle (USA). Dept. of Physics; Brookhaven National Lab., Upton, NY (USA); European Organization for Nuclear Research, Geneva (Switzerland)). 1986. Contract AC02-76CH00016. 12p. (CONF-860701—70). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004612.

From 23. international conference on high-energy physics; Berkeley, CA, USA (16 Jul 1986).

We present a phenomenological description of the "fifth force" which focuses on the implications of the existing data from satellite and geophysical measurements of gravity, the Eoetvoes experiment, decays into hyperphotons, and the energy-dependence of the K^0 - anti K^0 parameters.

17127 **(CEA-CONF—8466) On short-range rapidity fluctuations in high energy collisions.** Pechanski, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Mar 1986. 6p. (CONF-8603119—14). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750574.

From 21. Rencontre de Moriond: strong interactions and gauge theories conference; Les Arcs, France (16 Mar 1986).

Factorial rapidity moments of high energy collisions are shown to select short-range fluctuations of non-statistical origin. The observation of a power-law behaviour of these moments as a function of the rapidity resolution would give a clear signal of an expanding quark-gluon plasma.

17128 **(CEA-N—2479) Survey of research in elementary particle physics.** Baton, J.P.; Cohen-Tannoudji, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). May 1986. 170p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE87750537.

These notes are devoted to the current trends in elementary particle physics. They are not intended for the training of experts in the field. After a brief historical survey, one discusses the difficulties which have made necessary to move from classical physics to relativistic quantum physics. The main concepts of this new theory are rapidly presented. The experimental methods are discussed within a few typical experiments, already performed or scheduled. The main questions which are still unsolved are rapidly mentioned.

17129 **(EFI—811(38)-85) On the question of Higgs boson production in heavy quarkonium decays.** Alanakyan, R.A.; Grigoryan, S.G.; Matinyan, S.G. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700689.

The mechanism of production of H/sup 0/-boson in hadronic decays of the heavy eta(/sup 1/S/sub 0/)-quarkonium is studied. It is shown that the probability of production of a light Higgs boson (with msub(H) < 10 GeV) in the hadronic decay of quarkonium is higher than in radiative decays, while for msub(H) in 10-30 GeV range the probabilities of these decays are comparable. The differential characteristics of the H/sup 0/-boson in the mechanism under consideration are studied. 13 refs.; 3 figs.; 2 tabs.

17130 **(IFVE-OTF—85-30) Model of nonrelativistic quarks in self-consistent field.** Bornyakov, V.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700724.

The quasiclassical limit of the model, which describes the nonrelativistic quark interaction with a scalar field, is investigated. The static properties of proton in such a model have been calculated. 11 refs.; 3 figs.

17131 **(IFVE-OTF—85-71) Leptoproduction of nuclei as an analogue to production in hadron-hadron interactions (at the example of J/psi).** Batunin, A.V.; Smirnov, A.Yu. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700727.

Submitted to the journal Sov. J. Nucl. Phys. .

The role of states with hidden colour inside a nucleus in leptoproduction processes (at the example of J/psi-meson) production is investigated. A concrete production mechanism is proposed, appealing to the dual parton model of hadron-hadron interactions. Comparison with experiment is made. 8 refs.; 4 figs.

17132 **(INIS-mf—10252) Heavy flavour decays and the structure of weak interactions.** Bigi, I. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 20 Jun 1984. 66p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87750516.

The so-called Standard Model has been developed describing the electro-weak interactions by an SU(2)/sub L/xU(1) gauge theory the community's almost unanimous choice of the candidate theory for the strong interactions is QCD based on an SU(3) gauge theory. It is very instructive to recall the similarities and differences of these two theoretical frameworks. Both are based on non-abelian gauge theories with spin -1/2 matter fields and spin -1 radiation fields the latter being the carriers of the forces. Beyond this basic correspondence there are however crucial differences which I sketch under the headings "computational tools" and "predictive power"; there exist of course correlations between these two items. (orig./HSI).

17133 **(INIS-mf—10318) Nucleon-nucleon scattering in a nonrelativistic quark model.** Burger, J. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik). 22 Jul 1985. 155p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE87750515.

The aim of the present thesis is to understand the nucleon-nucleon interaction starting from a nonrelativistic quark model. In the framework of a quark model first a classification of 3q and 6q states is given which serve as basis for the calculations on the nucleon-nucleon scattering performed by means of the refined resonating-group method. For the comparison the results for the s-, p-, and d-phases are confronted to the results of conventional calculations in the meson-exchange picture (Bonn potential) on the rho + ω exchange. Additionally to the one-gluon exchange potential phe-

nomenological potentials are regarded in the calculations which make a comparison with experimentally determined nucleon-nucleon scattering phases possible.

17134 (INIS-mf—10556-Vol.1, pp 212-216) **Neutrino oscillations.** Sobel, H.W. (California Univ., Irvine, USA. Dept. of Physics). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Current theories for unification of the weak, electromagnetic and strong interactions require neither massless neutrinos or exact lepton number conservation. If neutrinos are massive the weak interaction eigenstates can be thought of as linear combinations of neutrino mass eigenstates. The search for neutrino oscillations provides limits on the mass difference between eigenstates, and the mixing angle. The current experimental limits are presented.

17135 (INIS-mf—10556-Vol.1, pp 299-308) **Electroweak interactions and new particle searches.** Marshall, R. (Rutherford Appleton Lab., Chilton, UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

A comparison is made of experimental data of the process e/sup +/e/sup -/->μ/sup +/μ/sup -/ with theoretical data ensuing from the electroweak theory. It is shown that the standard model of Glashow, Weinberg and Salam satisfactorily describes the electroweak interactions of leptons and quarks down to distances as small as 5x10/sup -3/ fm. The question of the substructure of quarks and leptons is also discussed. (Z.J.).

17136 (INIS-mf—10556-Vol.1, pp 259-273) **High transverse-momentum jets.** Lella Di, L. (European Organization for Nuclear Research, Geneva, Switzerland). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The production is dealt with of particles with high transverse momentum in collisions between protons and antiprotons. The interpretation is presented within the parton model and quantum chromodynamics, of experimentally observed high transverse momentum jets. Attention is focused on inclusive jet yield, angular distribution of parton-parton scattering, determination of the proton structure function, on the total transverse momentum of the two-jet system, jet fragmentation, charged-particle multiplicity in jets, energy flow around the jet axis, and two-jet invariant mass distribution. (Z.J.).

17137 (INIS-mf—10556-Vol.1, pp 275-281) **Hadronic production of leptons and photons.** McCubbin, N.A. (Rutherford Appleton Lab., Chilton, UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Although hadronic collisions produce direct leptons and photons much less copiously than hadrons, these leptons and photons are invaluable for probing hadronic structure and interactions. Roughly speaking, "deep inelastic" production of leptons and photons is reasonably well understood, but the production of "soft" leptons and photons is not. Aspects of both "deep inelastic" and "soft" production are discussed.

17138 (INIS-mf—10556-Vol.1, pp 282-287) **QCD and hard quark and gluon scattering.** Webber, B.R. (Cambridge Univ., UK. Cavendish Lab.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Given the quark and gluon structure functions of the colliding hadrons at a single energy scale, quantum chromodynamics predicts the cross sections and angular distributions for the production of hadronic jets and lepton pairs at all large momentum transfers. The theory also makes predictions about the fragmentation of quark and gluon jets into hadrons. Recent developments in the comparison between theory and experiment are reviewed and some expectations for higher energies are presented.

17139 (INIS-mf—10556-Vol.1, pp 316-319) **New directions in high energy physics.** Peccei, R.D. (Max-Planck-Institut fuer Physik und Astrophysik, Muenchen, Germany, F.R.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Prospects for new discoveries in the next generation of colliding beam machines are discussed. Suggestions for the substructure of quarks and leptons, as well as for the presence of bosonic partners of these particles are examined.

17140 (INIS-mf—10556-Vol.2) **Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2.** Janta, J.; Pantoflicek, J. (eds.). (Jednota Ceskoslovenskych Matematiku a Fyziku, Prague). 1984. 15p. (CONF-8408138—Vol.2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700738.

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The second volume of conference proceedings contains 56 papers in the following fields: phase diagram and structure of coulomb fluids; lattice calculations in condensed matter and paticle physics; localisation and disorder in two-dimensional electron systems; new methods for surface physics; total energy and dielectric properties of semiconductors; organic superconductors; electronic properties of polymers and applications; sensor research and technology; teaching physics for understanding or application; public awareness of physics; a catastrophic view of planet Earth; physics and agriculture. Three documents were inputted in INIS dealing with hadron spectroscopy using the Monte Carlo method in lattice gauge theory, with surface studies by sputtering and with ice ages. (M.D.).

17141 (INIS-mf—10556-Vol.2, pp 409) **Hadron spectroscopy using Monte Carlo technique in lattice gauge theory.** Martinelli, G. (Istituto Nazionale di Fisica Nucleare, Frascati, Italy. Lab. Nazionale di Frascati). 1984. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700738. (CONF-8408138—Vol.2).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

17142 (IPNO-TH—86-09) **Connection of two-particle relativistic quantum mechanics with the Bethe-Salpeter equation.** Sazdjian, H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Feb 1986. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750579.

We show the formal equivalence between the wave equations of two-particle relativistic quantum mechanics, based on the manifestly covariant hamiltonian formalism with constraints, and the Bethe-Salpeter equation. This is achieved by algebraically transforming the latter so as to separate it into two independent equations which match the equations of hamiltonian relativistic quantum mechanics. The first equation determines the relative time evolution of the system, while the second one yields a three-dimensional eigenvalue equation. A connection is thus established between the Bethe-Salpeter wave function and its kernel on the one hand and the quantum mechanical wave function and interaction potential on the other. For the sector of solutions of the Bethe-Salpeter equation having non-relativistic limits, this relationship can be evaluated in perturbation theory. We also device a generalized form of the instantaneous approximation which simplifies the various expressions involved in the above relations. It also permits the evaluation of the normalization condition of the quantum mechanical wave function as a three-dimensional integral.

17143 (ITEP—149(1985)) On (quasi) stable gluino. Okun, L.V.; Voloshin, M.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700753.

It is demonstrated that experimental limits exist on the abundance of the anomalous isotopes of hydrogen and oxygen, on the rate of proton decays in large underground water detectors and on the cross sections of production of anomalous particles in accelerator experiments exclude the existence of (quasi)stable gluino lighter than a few GeV. 22 refs.

17144 (ITEP—153(1985)) Once again about the role of gluonic mechanism in interaction of light Higgs boson with hadrons. Voloshin, M.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700754.

Low-energy theorems of QCD are employed to show that the coupling to gluons enchances hadronic decays of a light (Msub(H) < or approximately 1.5GeV) Higgs boson by few orderes of magnitude in comparison with previous estimates. This coupling is also essential for H boson with a larger mass.Thus the μ/sup +/μ/sup -/ branching ratio is heavily suppressed. A simple low-energy theorem as derived for production amplitude of light H which also enables to evaluate non-perturbative contribution to the amplitude. By a method analogous to bremsstrahlung calculation the branching ratio of γ decay into a light Higgs plus hadrons is evaluated to be of the order of 3 x 10/sup -5/ if the coupling of H to b-quark is described by the standard minimum model. 20 refs.; 3 figs.

17145 (JINR—E-2-85-737) Semileptonic decays of ordinary and charmed Λ/sup +/sub(c) baryons in chiral theory. Kalinovskij, Yu.L.; Sarikov, N.A.; Takhtamyshev, G.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700776.

The phenomenological chiral Lagrangian method is applied for describing the semileptonic decays of ordinary and charmed Δsub(c)sup(+) baryons. The calculated partial widths (or relative probabilities) of ordinary baryon decays agree with the experimental data available. That confirms the Cabibbo theory with chiral currents and permits to predict the probabilities of such decays not exactly yet measured. For Δsub(c)sup(+) three- and four-body decays are calculated. Probability of Cabibbo-resolved decay of Δsub(c)sup(+)->Δsub(eν) is in agreement with the data on Δsub(c)sup(+)->Δechi, whereas for Δsub(c)sup(+)->p$\pi e\nu$ and Δsub(c)sup(+)->pK$e\nu$ calculated value is smaller as compared to the experimental one for Δsub(c)sup(+)->pechi. The lifetime of Δsub(c)sup(+) is estimated to be equal to rsub(Δsub(c)sup(+))=(2.0+-0.7)x10.sup(-13)s. 9 refs.; 1 fig.; 2 tabs.

17146 (JINR—E-2-85-808) Mass formula for multibaryon resonances and prediction of a new stable baryon. Nichitiu, F. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700780.

The main ideas for deriving a new mass formula for multibaryons as well as for baryons are presented. The price paid should be the existence of some new baryon states which do not destroy the usual octet and decupled representation. The most interesting baryon new state seems to be R(J=1/2, I=3/2) of mass approximately 1025 MeV which should be stable against the strong interaction (a good candidate for a stable hybrid state). 17 refs.; 8 figs.; 1 tab.

17147 (JINR—R-2-85-343) On pair production of Majorana particles in collisions of polarized e/sup +/ and e/sup -/. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701333.

Submitted to the journal Phys. Lett. and 8. Warsaw symposium on elementary particle physics, 1985.

Production of two different Majorana fermions in collisions of longitudinally polarized e/sup +/ and e/sup -/ is considered on the basis of general invariance principles. Polarization characteristics of the process are discussed in detail. Possible methods for checking CP and CPT-invariance are suggested. Some tests which would allow to distinguish whether the final particles are of Majorana or Dirac type are proposed. 6 refs.

17148 (JINR—R-2-86-147) Gluon bremsstrahlung in supersymmetric QCD. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1986. 6p. (In Russian). (CONF-8604294—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701145.

From International seminar quark; Tbilisi, USSR (1 Apr 1986).

Submitted to the journal Theor. Math. Phys. .

In the lowest a/sup 3/ order perturbation theory of supersymmetric QCD a gluon bremsstrahlung in the scalar quark pair production is calculated. The factorization of corresponding Born cross section and generalized infrared factors is shown. 9 refs.; 2 tabs.

17149 (JINR-R—1-85-228) Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s. Arkhipov, V.V.; Astvatsaturov, R.G.; Knapik, E.; Plyashkevich, S.N.; Khachaturyan, M.N.; Chvyrov, A.S.; Aslanyan, P.Zh.; Khudaverdyan, A.G.; Ioan, I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700789.

Submitted to the journal Sov. J. Nucl. Phys. .

The differential cross section of the reaction πp -> eta/sup 0/Δ/sup 0/ (1232) has been measured in the region of momentum transfers from tsub(min) to 0.3 (GeV/c)/sup 2/. A significant minimum observed in the forward direction in the differential cross section indicates a dominance of the helicity flip amplitude. The experimental data were fitted by the formula dσ/dt=A(1-gCt)esup(Ct), where g is the ratio of the spin flip and spin nonflip amplitudes. The following values were found for A, g and C: A=(65.7 +- 2.3) νb(GeV/c)/sup 2/; g=(3.7 +- 0.2); C=7.3 +- 0.6 (GeV/c)sup(-2). The total cross section for the reaction π/sup -/ -> ν/sup 0/Δ/sup 0/(1232) within the experimental errors, agrees, with the isotopic invariance prediction. 10 refs.; 5 figs.; 3 tabs.

17150 (JINR-R—2-85-152) Bag model from the preons. Matveev, V.A.; Chizhov, A.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700793.

Submitted to the journal Sov. J. Nucl. Phys. .

A dynamic bag-like model is suggested for composite quarks and leptons. A special compensation condition ensures that chiral violations are small while sizes and energy levels of composite fermions are quantized. An expression for the magnetic moment of the composite system is obtained in the small-size limit with the collective motion taken into account. It is shown that for the Harari rishon model one is unable to get satisfactory values of the magnetic moments for all composite fermions simultaneously. 10 refs.; 1 tab.

17151 (JINR-R—2-85-767) Pseudoscalar and vector meson masses in the quark loop model. Volkov, M.K.; Ivanov, A.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700798.

Submitted to the journal Teor. Mat. Fiz. .

On an example of calculating vector and pseudovector mass spectra self-consistency of the superconductive quark model (the quark loop model) is proved. By fixing the mass difference of u, s-quarks and u, d-quarks from the mass difference of rho-, phi-mesons and decay ω -> π/sup +/π/sup -/ width it is possible to describe correctly both the vector and pseudovector meson mass spectrum, as well as such a subtle effect as the mass difference of K/sup 0/- and K/sup +/-mesons. Besides, a correct value is found for the dif-

ference of decay constants of π- and K-mesons (Fsub(π) and Fsub(K)). 12 refs.

17152 **(JINR-R—2-85-831) Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering.** Akhundov, A.A.; Bardin, D.Yu.; Shumejko, N.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700800.

Submitted to the journal Sov. J. Nucl. Phys. .

Higher-order radiative effects in the deep inelastic lepton-nucleon scattering are discussed. One of such effects, the electromagnetic radiative correction to the elastic radiative tail, is completely calculated. As is shown, this correction gives everywhere, except of the infrared region, a rather small contribution of an order of O(α). 26 refs.; 1 fig.

17153 **(LAPP-TH—147) Higgs boson production by W and Z collisions.** Lindfors, J. (Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules). Oct 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750585.

We present a general formulation for the WW → H and ZZ → H mechanisms of heavy Higgs boson production in hadron colliders. The known results in the effective W approximation are obtained from the quark-parton model limit of the double inelastic scattering configuration. In addition we estimate contributions from the elastic scattering configurations and from αsub(s)-processes of QCD.

17154 **(LAPP-TH—152) Magnetic monopoles: from classical to quantum physics.** Seixas, J. (Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules). Jan 1986. 10p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750580.

We develop a modified Metropolis algorithm and use it to construct axial-symmetric and multimonopole classical solutions in the (lattice-regularized) SO(3) Georgi-Glashow model outside the BPS limit. As an example we then use one of those solutions as an ansatz to study the quantum stability of the configuration.

17155 **(SLAC-PUB—4144) Heavy flavors.** Cox, B.; Gilman, F.J.; Gottschalk, T.D. (Fermi National Accelerator Lab., Batavia, IL (USA); Stanford Linear Accelerator Center, Menlo Park, CA (USA); California Inst. of Tech., Pasadena (USA)). Nov 1986. 13p. (CALT—68-1411; FNAL/C—86/166; CONF-8606215—28). NTIS, PC A02/MF A01. File Number DE87004559.

From Summer study on the physics of the superconducting super collider ↑; 0.

A range of issues pertaining to heavy flavors at the SSC is examined including heavy flavor production by gluon-gluon fusion and by shower evolution of gluon jets, flavor tagging, reconstruction of Higgs and W bosons, and the study of rare decays and CP violation in the B meson system. A specific detector for doing heavy flavor physics and tuned to this latter study at the SSC, the TASTER, is described. 36 refs., 10 figs.

17156 **Production of mirror fermions near the Z/sup 0/ peak.** Banks, T.; Karliner, M. (Stanford Linear Accelerator Center, CA, USA; Tel Aviv Univ., Israel; Stanford Linear Accelerator Center, CA, USA). *Nuclear Physics [Section] B;* **281**: No. 3/4, 399-410(2 Feb 1987). Contract AC03-76SF00515.

Several attractive theories predict the existence of mirror fermions. There is a good theoretical reason to expect that the lightest mirror fermions might have relatively long lifetimes. We explore the experimental consequences of such a possibility, focusing on mirror lepton production at the SLC near the Z/sup 0/ resonance. We find that by going slightly off resonance or by polarizing the electron beam one can clearly distinguish the mirror leptons from ordinary leptons.

17157 **CP violation in heavy flavor decays: Predictions and search strategies.** Bigi, I.I.; Sanda, A.I. (Stanford Linear Accelerator Center, CA, USA; Rockefeller Univ., New York, USA). *Nuclear Physics [Section] B;* **281**: No. 1/2, 41-71(19 Jan 1987). Contract AC03-76SF00515;AC02-81ER40033.

We present a comprehensive analysis of the phenomenology relevant for CP violation in exclusive B and D decays. Some of the CP asymmetries can be calculated rather reliably in the standard model, while others contain large uncertainties. We point out that studies of inclusive decays will have to deal with partial cancellations occurring between different exclusive channels. None of the measurements will be easy. Yet a realistic evaluation f the promise the various searches hold out cannot be given at present; first, one has to build a data base on the production and decay properties of heavy flavor decays. We try to identify the required information.

6453 Particle Invariance Principles And Symmetries

17158 **(CEA-CONF—8513) Conformal invariance and finite size effects in critical two dimensional statistical models.** Itzykson, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). May 1986. 31p. (CONF-8605207—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750578.

From 9. Sitges conference; Sitges, Spain (26 May 1986).

A systematic review of the recent achievements in conformal invariant two-dimensional field theories would already require a volume size. Here we discuss some finite size effects, because they reveal important features. The computation of the partition function in a finite geometry - a torus - enables one to understand the spectrum of the theory. The later is a compendium of the critical dimensions of the various operators. Two simple examples, namely bosonic or fermionic free fields (respectively the Gaussian and the Ising model) serve as a pedagogic introduction, although the corresponding computations are not without some subtleties. We then proceed to considerations related to modular invariance.

17159 **(JINR—E-2-85-794) Construction of finite N=1 supersymmetric Yang-Mills theories.** Ermushev, A.V.; Kazakov, D.I.; Tarasov, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700779.

Submitted to the journal Pis'ma Zh. Ehksp. Teor. Fiz. .

We propose an algorithm to construct ultraviolet finite N=1 supersymmetric gauge theories. Necessary and sufficient conditions for divergences to cancel in all orders of perturbations theory are exhausted in one-loop order. 7 refs.

17160 **(LA-UR—86-4144) More on the first order chiral symmetry transition in QCD.** Gupta, R. (Los Alamos National Lab., NM (USA)). Sep 1986. Contract W-7405-ENG-36. 9p. (CONF-8609142—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003726.

From Lattice gauge theory meeting; Upton, NY, USA (15 Sep 1986).

We present evidence from numerical simulations for a first order chiral symmetry restoration transition in QCD at finite temperature. Also, for quarks in the fundamental representation, there is a simultaneous deconfinement transition. These transitions are present only for small quark masses. We use an exact algorithm to incorporate the dynamical quarks.

6454 Field Theory

REFER ALSO TO CITATION(S) 17055, 17056, 17160, 17391

17161 (DOE/ER/40226—2) Theoretical investigations in elementary particle physics: Progress report, June 1, 1986-May 31, 1987. Weiler, T.J.; Kephart, T.W. (Vanderbilt Univ., Nashville, TN (USA)). Jan 1987. Contract FG05-85ER40226. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005302.

Progress is reported in the areas of global anomalies in six dimensions, E_8 superpotentials and their applications to heterotic superstring phenomenology, and the theory of cosmic axions. (LEW)

17162 (IFVE-OTF—85-9) Problems of CP-violation in early unification theories. Liparteliani, A.G.; Monich, V.A.; Volkov, G.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 44p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700723.

The present work studies possible mechanisms of P and CP-violation in the frames of an approach based on early unification of fundamental local symmetries, i.e., Pati-Salam four-colour symmetry, extended weak isotopic symmetry and that of quark-lepton generations. The work also studies the influence of generations mixing on the rates of rare processes in each of 3 classes of interactions. 46 refs.; 2 tabs.; 1 fig.

17163 (IFVE-OTF—85-117) Approach to calculation of the infrared region contribution to vacuum expectation values of gluonic and quark fields. Arbuzov, B.A.; Boos, E.E.; Turashvili, K.Sh. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700729.

Submitted to the jornal Z. Phys.,C.

On the basis of the infrared asymptotics of the lower QCD Green functions obtained before a definition and elaborate a technique for calculating nonperturbative vacuum expectations of gluon and quark fields are proposed. In calculations the known QCD parameters was used: constituents quark masses, the confining potential slope and the QCD parameter Λ. The values obtained for the vacuum expectations agree well with the experiment. 26 refs.

17164 (ITEF—182(1984)) On the anomalous supermultiplet in th Wess-Zumino model. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701321.

An anomalous multiplet construction technique is suggested; it doesn't contain axial anomaly in the Wess-Zumino model. In this technique supercurrent anomaly is determined by a surface term. 9 refs.; 1 fig.

17165 (ITEP—45(1985)) Instantons versus SUSY. Shifman, M.A.; Vainstejn, A.I.; Zakharov, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 58p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87700751.

This survey is a written version of lectures given at the Bakuriani Workshop on High Energy Physics, January, 1985. The authors discuss the recent discovery on a new phenomenon - dynamical symmetry breaking in supersymmetric gauge theories with matter - which is generated by instantons. Under a certain choice of the matter multiplets the gauge invariance is inevitably spontaneously broken, gauge bosons acquire masses, the evolution of the running coupling constant is frozen and there is a weak coupling regime. Sometimes the pattern includes also spontaneous supersymmetry breaking. Both basic aspects of the mechanism and particular dynamical scenarios realized in typical models are described. 33 refs.; 4 figs.; 1 tab.

17166 (ITEP—156(1985)) Multiinstantons and monopoles in SU(2) gluodynamics. Simonov, Yu.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700756.

Specially constructed multiinstantonic solutions - called tau-monopoles - are shown to possess properties both of instantons and monopoles. In the limit of infinite length in x/sub 4/ direction they go over into Rossi monopoles with colormagnetic field similar to that of 'tHooft-Polyakov monopole. A model of vacuum stochastically populated with tau-monopoles is constructed which provides an area law for spacial Wilson loops. 23 refs.

17167 (ITF—86-4-R) Quantum field theory renormalization in curved space-time and renormalization group equations. Bukhbinder, I.L. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 21p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700758.

The structure of quantum field theory renormalization in curved space-time is investigated. The renormalization group equations for vacuum energy and vertex functions in an external gravitational field are established. It is shown that the asymptotically free theories may be asymptotically conformal invariant. The properties of the effective potential in an external gravitational field are studied. 43 refs.

17168 (ITF—86-18-R) Chiral anomalies and finite-mode regularization of the fermion integral. Andrianov, A.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700759.

The dynamical frame method in the space of spinor wave functions is applied to determine and regularize the fermion functional integral in a gauge-invariant way. Both topological and non-topological anomalies are obtained in a manifest form by means of the finite-mode regularization of generating functional for fermion currents. The requirement of generalized unitarity gives unambiguously the anomaly structure. A non-local extension of chiral transformations and conservation laws for axial currents is considered. 28 refs.

17169 (ITF—86-31-R) Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields. Gorenshtejn, M.I.; Mogilevskij, O.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700761.

The problem concerning a continuum limit in the lattice gluon field thermodynamic with SU(N) gauge group is considered. An examination of exactly solvable models provides a receipt for the lattice and finite volume effects to be eliminated. 22 refs.; 4 figs.; 3 tabs.

17170 (JINR—E-2-85-779) Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory. Korchemskij, G.P.; Radyushkin, A.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700778.

Submitted to the journal Yad. Fiz. .

The approach based on the loop space formalism is applied for the investigation of renormalization properties of the Wilson loop in higher orders of perturbation theory. The properties are considered of the subtraction procedure for the cusp singularities of path-ordered exponentials. The cusp anomalous dimension is calculated in the order asub(s)sup(2). The general form of its perturbative expansion is obtained in the limit of large Minkowski cusp angles y. The analyticity properties with respect to y of the results obtained are investigated. The relation of these results to the non-leading infrared behaviour of the quark form factor is demonstrated. The final expressions can be applied for construction of the anomalous dimensions of the renormalization group equations de-

scribing the infrared asymptotics of perturbative QCD. 18 refs.; 5 figs.

17171 **(JINR—E-2-85-865) Dualities in the d=2 asymmetric chiral field sigma models.** Ivanov, E. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700781.

Continuous dual symmetry of equations of asymmetric chiral field (ACF) in d=2 (equations of non-linear σ-models with ambiguous effect) and realization of duality transformations in explicit geometrical language of Cartran form is disclosed. Connection of this symmetry with ACF integrability is clarified. Both simple and supersymmetrical cases are considered. Notions of dual algebra and dual σ-model are introduced, their significance for understanding classical and quantum structure d=2 of ACF models is revealed. It is shown, in particular, that transition to points of infrared ACF stability can be described purely algebraically as constraction of dual algebra bringing about the fact that space-factor of the corresponding dual σ-model becomes plane. Equations of asymmetrical n vector-field model are analyzed from the similar view point. The Cartran form method permits to state that classical dynamics of this model is trivial. 28 refs.

17172 **(JINR—R-2-85-729) Quantum principles in field interactions.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 22p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701334.

The concept of quantum principle is introduced as a principle, the formulation of which is based on specific quantum ideas and notions. Three of such principles are considered: the principle of quantizability; the principle of local gauge symmetry; the principle of supersymmetry; and their role in development of the quantum field theory (QFT). Concerning the first of them formal aspects and physical contents of the renormalization procedure in QFT, its relation to ultraviolet divergences and the renorm-group are analyzed. The renormalizability property, formulated as an existence condition of a self-consistent quantum version with a given mechanism of the field interaction, turns out to be equivalent to quatizability. It is shown that the consecutive, from a historical point of view, use of these quantum principles puts still larger limitations on possible forms of field interactions. 21 refs.

17173 **(JINR-R—2-85-420) Fock representation for quaternion fields.** Govorkov, A.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700794.

Submitted to the journal Theor. Math. Phys. .

The Fock representation for a nonrelativistic hermitian (Majorana) quaternion field is established and the corresponding quantum mechanics of parafermions of third order is formulated. The difference between gauge pseudocolour SO(3)-symmetry, the automorphism group of quaternions, and the global SU(3)-symmetry of parafermion states in the Fock-space is emphasized. 18 refs.

17174 **(JINR-R—2-85-520) Is it necessary to prove the "potential" confinement in QCD.** Pervushin, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700795.

Submitted to the journal Found. Phys. .

The minimal approach to quantization scheme of non-Abelian theory in terms of physical gauge-invariant variables is discussed. It is shown that such a minimal quantization scheme already in the framework of perturbation theory contains the theoretical basis for nonobservation of free colour particles and for the method of measuring their quantum numbers in deep inelastic processes. The proof of the potential nonperturbative confinement in such an approach is unnecessary. 18 refs.

17175 **(JINR-R—2-85-723) Metric nature of spinor field.** Chernikov, N.A.; Shavokhina, N.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700797.

Connection is studied between the following algebraic, geometric, and physical objects (taken in a historical sequence): triples of Pythagoras numbers, Grassmann algebras, Cliffford algebras, cartan spinors the Dirac equation, the Fock-Ivanenko covariant derivative, fermion and boson fields. Pythagoras formulae for a right triangle are shown to lead immediately to a spinor representation of the Lorentz orthochronous group. The state vector in quantum fermion theory is proved to be a spinor of the Euclidean space, and in quantum boson theory a spinor of the symplectic space. A metric nature of the spinor field is to be emphasized: no metric tensor, no spinor fields. The practical problem of ancient ages, to draw a right triangle on the Earth surface, appears to be closely related with basic physical theories of modern times. 8 refs.

17176 **(JINR-R—2-85-942) Fermionic string model in spaces of Lie group.** Isaev, A.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700801.

Submitted to the journal Teor. Mat. Fiz. .

Theory of string (with fermionic degrees of freedom) moving in a curved space-time (in Lie group space) is discussed. Dynamics of fermionic string in the noncompact simple group Lie spaces is studied using field theory methods. The general solution of Cauchy problem is obtained, and a complete set of integrals of motion is constructed. The classical analogues of physical particles operators are obtained by the collective coordinate method. It enables one to construct dual scattering amplitudes in the theory considered. 21 refs.

17177 **(JINR-R—4-85-816) Solution of Faddeev differential equations for scattering problem in three identical particle system. Calculation algorithm. The finite-dimensional approximation method.** Belyaev, V.B.; Kochkin, V.I.; Kartavtsev, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700802.

A Faddeev equation for a radial part the Faddeev component of a three-particle wave function was solved in order to determine the length of scattering of a particle on a bound pair. The method of solution is based on finite-dimensional approximation of the Laplacian by a linear combination of projection operators. For the potential averages over the hyperspherical angle the scattering length was found to be 3.59 F within the 4-rank approximation. 3 refs.; 1 tab.

17178 **(JINR-R—9-85-271) Relativistic theory of forming space charge laminar flows.** Aleksakhin, Yu.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700806.

Submitted to the journal Sov. Phys. - Tech. Phys. .

The set of equations of O.Buneman's self-consistent electrodynamics which describes the non-vortical laminar flow is completed with an equation for the charge scalar density. A non-geometrical approach to the problem of forming the azially symmetric Brillouin flow is formulated. Based on paraxial expansion a synthesis method for the design of solid Brillouin flow sources is developed. An example of computation in the first paraxial approximation is given. 14 refs.

17179 **(LA-UR—86-4152) Supersymmetry and model building.** Raby, S. (Los Alamos National Lab., NM (USA)). Jun 1986. Contract W-7405-ENG-36. 49p. (CONF-8606259—1). NTIS, PC A03/MF A01; GPO Dep. File Number DE87003727.

From Theoretical Advanced Study Institute conference; Santa Cruz, CA, USA (1 Jun 1986).

An introductory review of supersymmetry and supersymmetric model building is presented. The topics discussed include, a brief introduction to the formalism of supersymmetry, the gauge hierarchy problem, the minimal supersymmetric standard model and supersymmetric grand unified theories.

17180 **(LBL—22277) String theory and holomorphic line bundles.** Alvarez, O. (Lawrence Berkeley Lab., CA (USA)). 29 Sep 1986. Contract AC03-76SF00098. 8p. (UCB-PTH—86/30; CONF-8604202—3). NTIS, PC A02. File Number DE87002562.

From 7. workshop on grand unification; Toyama City, Japan (16 Apr 1986).

Some elementary facts about holomorphic line bundles are discussed along with some applications to string theory.

17181 **(NBI-HE—84-39) Chiral order parameter of Wilson fermion formulation in a lattice CP/sup N-1/ model.** Abdalla, E.; Abdalla, M.C.B.; Kawamoto, N. (Niels Bohr Inst., Copenhagen (Denmark)). Oct 1984. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750533.

We study the Wilson formulation of fermions in the CP/sup N-1/ model by means of a non-standard definition of the vacuum.

17182 **(NUB—2663) Solving QCD using Monte Carlo Renormalization Group method.** Gupta, R.; Patel, A. (Northeastern Univ., Boston, MA (USA). Dept. of Physics; Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA)). 1984. Contract AS03-81ER40029. 8p. (UCSD—10P10-240; CONF-8411288—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002875.

From DPF meeting; Santa Fe, NM, USA (1 Nov 1984).

The need for the use of Monte Carlo Renormalization Group method for solving QCD is stressed. MCRG results for the non-perturbaive β-function and the improved action for SU(3) are presented using the $\sqrt{3}$ blocking transformation introduced by Cordery, Gupta and Novotny. The existing Monte Carlo results are analyzed to check for scaling in the range of couplings in which the β-function shows a dip. Finally a status report of MCRG calculations using an improved action is given. 10 refs.

17183 **Energy-momentum tensor on a Riemann surface.** Sonoda, H. (Lawrence Berkeley Lab., CA, USA). *Nuclear Physics [Section] B;* **281**: No. 3/4, 546-572(2 Feb 1987). Contract AC03-76SF00098.

The tecniques of conformal field theory developed for a Riemann sphere by Belavin, Polyakov, and Zamolodchikov are generalized to any Riemann surface. We especially consider the energy-momentum tensor in the bosonic string theory of Polyakov. The correlation functions of the energy-momentum tensor with local fields are studied in detail. As an application we compute the scattering amplitudes of null physical states explicitly to show that they vanish.

17184 **Thirring strings.** Neuberger, H.; Niemi, A.J.; Semenoff, G.W. (Lawrence Berkeley Lab., CA, USA; Ohio State Univ., Columbus, USA. Dept. of Physics; California Univ., Berkeley, USA. Dept. of Physics; British Columbia Univ., Vancouver, Canada. Dept. of Physics). *Physics Letters [Section] B;* **181**: No. 3/4, 244-248(4 Dec 1986). Contract FG05-86ER40265;AC03-76SF00098;AC02-76ER01545.

Previously it has been observed that a squeeze transformation modifies the central charge of the Virasoro algebra of closed bosonic strings. Here it is shown that this transformation maps a free bosonic string to a string based on the massless Thirring model. Diagonalization of the mass operator of the Thirring redefines the central charge back to its canonical value, and the squeeze parameter assumes the role of the compactification radius of a bosonic coordinate of the string.

17185 **Low energy superstring theory.** Ovrut, B.A. (Rockefeller Univ., New York, NY). pp 21-28 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract AC02-81ER40033.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

The spontaneous breakdown of the E_8 gauge group of low energy superstring theory is discussed, and a method given for determining the residual gauge group. They show that certain chiral supermultiplets can be naturally light and that, as a consequence, the residual gauge group SU(3)/sub C/ x SU(2) /sub L/ x SU(2)/ sub R/ x U(1)/sub Y/ x U(1) is singled out.

17186 **Scalar sector of gauge theories and the quest for a unified theory.** Beg, M.A.B. (Rockefeller Univ., New York, NY). pp 61-78 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract AC02-81ER40033.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

The state of the scalar sector in gauge theories is critically examined. Much of the discussion is predicated on the generally accepted - albeit not rigorously proven - result that self-coupled scalar fields constitute a trivial dynamical system characterized by a unit S-matrix. A process of elimination leads to the conclusion that canonical electroweak theory can find consistency only after grand unification embedding is followed by a further synthesis; if there be but four basic forces, this would mean with gravity. Alternatives considered include a provisional scenario that permits one to live with the standard model over a substantial energy domain, and a bold proposal to dispense with elementary scalars altogether by introducing hypercolor-based dynamical symmetry breaking. Experimental implications of these constructs are reviewed; it is suggested that they are sufficiently interesting to warrant investigation even if the theories that yielded them fail to survive. Prospects of the unification program, with each of its steps evidently needed to solve embarrassing theoretical problems, are briefly discussed in the light of recent attempts to tame gravitation.

17187 **Problem of families.** Senjanovic, G. (Brookhaven National Lab., Upton, NY). pp 103-114 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract AC02-76CH00016.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

The authors review attempts to unify fermionic families and discuss the question of quark and lepton masses.

17188 **Fermion masses in GUTs with intermediate scales.** Panagiotakaopoulos, C. (Rockefeller Univ., New York, NY). pp 139-142 of Particles and the universe. Lazarides, G.; Shafi, Q. (eds.). Amsterdam, Netherlands; North-Holland Physics Publishing (1986). (CONF-8506195—). Contract AC02-81ER40033.

From International symposium on particles and the universe; Thessaloniki, Greece (24 Jun 1985).

The relation m/sub t//m/sub c/ $\approx$ m/sub b//m/sub s/, with m/sub s/ not equal to m/sub μ/, which predicts a top quark mass close to 40 GeV is consistently derived in the context of SO(10) and E_8 grand-unified theories with appropriate intermediate scales.

65 PHYSICS II

17189 **(INIS-SU—370) Experimental and theoretical physics. Collection.** (AN SSSR, Moscow. Fizicheskij Inst.). 1984. 64p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

Separate abstracts were prepared for 9 chapters in this collection. (DWL)

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 16160, 17105, 17264

17190 **(BARC—1253) Annual report of the Nuclear Physics Division [for] period ending December 31, 1982.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 130p. NTIS (US Sales Only), PC A07/MF A01. File Number DE87701249.

The research and development work of the Nuclear Physics Division of the Bhabha Atomic Research Centre, Bombay for the period ending on 31 December 1982 is reported in the form of individual summaries arranged under the headings: (1) nuclear physics, (2) solid state physics, and (3) instrumentation and techniques. A

list of papers by the staff-members of the Division published in journals and presented at conferences during the report period is also given.

17191 **(BARC—1297) Progress report on nuclear data activities in India for the period from July 1984 to December 1985.** Anand, R.P. (comp.). (Bhabha Atomic Research Centre, Bombay (India)). 1986. 52p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87700666.

Nuclear data activities in the Bhabha Atomic Research Centre, Bombay and the Indira Gandhi Centre for Atomic Research (formerly known as the Reactor Research Centre), Kalpakkam are reported in the form of summaries. The report contains information about nulcear data measurements, compilations, evaluations and other related work. (M.G.B.).

17192 **(CONF-861193—2) Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models.** Poenitz, W.P.; Peelle, R.W. (Argonne National Lab., Idaho Falls, ID (USA); Oak Ridge National Lab., TN (USA)). 17 Nov 1986. Contract W-31109-ENG-38. 6p. NTIS, PC A02. File Number DE87004688.

From IAEA specialists' meeting on covariance methods and practices in the field of nuclear data; Rome, Italy (17 Nov 1986).

A straightforward derivation is presented for the covariance matrix of evaluated cross sections based on the covariance matrix of the experimental data and propagation through nuclear model parameters. 10 refs.

17193 **(DOE/ER/40159—113) The structure of nuclei far from beta stability: Progress report for the period May 15, 1986 to May 14, 1987.** Zganjar, E.F. (Louisiana State Univ., Baton Rouge (USA). Dept. of Physics and Astronomy). 1987. Contract FG05-84ER40159. 39p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004849.

Investigations of the Z = 78-82 region involve gold, mercury, and thallium isotopes. A great deal of effort is being directed at a description of shape coexistence in this region. Additional research in the neutron deficient rare earth region and the Z = 36, N approximately equal to Z regions concerns nuclear deformation. The Z = 36 region research has been conducted using an in-beam gamma-ray spectroscopy system using a recoil mass spectrometer. Structure studies of Ba-145 are also being conducted. 31 refs., 7 figs.

17194 **(HMI-B—429) HMI Section of Nuclear and Radiation Physics - Annual report 1985.** (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kern- und Strahlenphysik). 1986. 196p. (In German and English). NTIS (US Sales Only), PC A09/MF A01. File Number DE87750520.

This annual report contains extended abstracts about the work performed at the named institute concerning theoretical physics, nuclear reactions, hyperfine structure, atomic collisions, and developments of the VICKSI accelerator together with a list of publications and talks. (HSI).

17195 **(IAEA-TECDOC—385) International Centre for Theoretical Physics. Scientific activities in 1985.** (International Atomic Energy Agency, Vienna (Austria)). Aug 1986. 129p. NTIS (US Sales Only), PC A07/MF A01. File Number DE87701287.

A review of the scientific activities of the Centre, including workshops, research, and training-for-research is presented. The scientific program consists of ten main fields, Physics and Energy, Fundamental Physics, Physics of Condensed Matter, Applied Physics, Physics of the Living State, Physics of the Environment, Mathematics, Physics Teaching, Experimental Physics Training, and Physics and Development. In addition to a brief description of each workshop, symposium, college, and meeting, tables summarizing the participation at ICTP activities are given. A list of preprints and internal reports issued in 1985 is included. Tabs.

17196 **(INDC(NDS)—182/GE) Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986.** Lorenz, A. (ed.). (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). Oct 1986. 72p. (CONF-8606171—Summ.). NTIS (US Sales Only), PC A04/MF A01. File Number DE87700915.

From IAEA meeting on the coordination of the international nuclear structure and decay data evaluation network; Grenoble, France (2 Jun 1986).

The seventh meeting of the International Network of Nuclear Structure and Decay Data (NSDD) Evaluators concentrated on the organizational aspects of the coordination of the NSDD network and on the presentation and discussion of papers related to the physics of evaluation of NSDD. The report contains short status reports from NSDD Network members, the status of the mass-chain and nuclear structure data, a discussion of evaluation rules and procedures and a short presentation of the next activities.

17197 **(ITEF—25(1985)) Inclusive cross sections of π/sup +/, p, /sup 2/H, /sup 3/H, /sup 3/He yields at angle 3.5 deg in 6.37 and 8.08 GeV/c proton interactions with Be, Al, Cu, Ta nuclei.** Aref'ev, A.S.; Vorontsov, I.A.; Ergakov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700742.

Inclusive differential cross sections of π/sup +/, p/sup 2/H, /sup 3/H, /sup 3/He yields at the angle of 3,5 degree are measurered in secondary 1.25 + 7.06 GeV.c momentum interval during 6.37 and 8.08 GeV/c proton interaction with Be, Al, Cu, Ta nuclei. The data obtained are presented in tables. 5 refs.; 5 figs.

17198 **(ITEF—121(1985)) Isotope and isotonic effects in nucleon inclusive production at high energies.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701320.

Proton, neutron and deuteron yields as well as spectrum shape of protons, produced in π/sup -/(5 GeV/c) and p(7 GeV/c) interactions with different nuclei are analysed. A special attention is paid to data, obtained at separated /sup 6/Li, /sup 7/Li, /sup 10/B, /sup 11/B, /sup 58/Ni, /sup 64/Ni, /sup 112/Sn, /sup 124/Sn isotopes. Isotope-effect, which consists in the fact, that protonyields do not depend on isotope neutron composition and the isotope-effect, which consists in the fact that neutron yields do not depend on Z in isotopes are confirmed for heavy nuclei. It isshown, that the isotope-effect is realised only averagely: in the range of T=80-180 MeV. Minor dependence (of the order of 3%) of proton spectrum slope on the isotope neutron composition is observed. 12 refs.; 6 figs.

17199 **(ITEF—130(1985)) Some topological characteristics of π/sup -/meson interactions with nuclei.** Vorob'ev, I.I.; Perepelitsa, V.F.; Ismatova, F.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700747.

Some topological characteristics of π/sup -/-meson interactions with 2.9 and 4 GeV/c momenta with C and Xe nuclei such as distributions by the number of prongs, proton multiplicities and net charge including two-dimensional ones are presented. All the data are obtained under conditions of 4π-geometry. 9 refs.; 4 figs.; 4 tabs.

17200 **(JAERI-M—86-067) Report of the joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators (II).** (Japan Atomic Energy Research Inst., Tokyo). Apr 1986. 121p. (CONF-8601103—). NTIS (US Sales Only), PC A06/MF A01. File Number DE87701064.

From 2. joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators; Tokai, Ibaraki, Japan (9 Jan 1986).

A meeting of the second joint seminar on Heavy-Ion Nuclear Physics and Nuclear Chemistry in the Energy Region of Tandem Accelerators was held after an interval of two years at the Tokai Research Establishment of the JAERI, for three days from January 9 to 11, 1986. In the seminar, about 70 nuclear physicists and nuclear chemists of JAERI and other Institutes participated, and 38 papers were presented. These include general reviews and topical subjects which have been developed intensively in recent years, as well as the new results obtained by using the JAERI tandem accelerator. This report is a collection of the papers presented to the seminar.

17201 **(JINR-R—1-85-820) Four-dimentional hadron jets-universal characteristics of particle multiple production.** Baldin, A.M.; Batyunya, B.V.; Gramenitskij, I.M.; Grishin, V.G.; Didenko, L.A.; Kuznetsov, A.A.; Metreveli, Z.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700790.

Submitted to the journal Yad. Fiz. .

The data on multiple particle production in pp-, anti pp-, π/sup -/p-, π/sup -/C-pC and pTa interactions from 6 to 205 GeV/c momentum are analysed in the framework of a new relativistic invariant method. The hadron distributions (π/sup -/, Ksub(s)sup(0), LAMDAsub(0)) on squared four-velocity relative to jet axis have been obtained. It is shown that these distributions are independent on the energy and are the same for quark and multiquark system hadronization at Psub(lab) >22 GeV/c momentum. The observed universal properties of four-dimensional jets are perhaps fundamental characteristics of the interactions of colour charges with vacuum. 14 refs.; 6 figs.; 6 tabs.

17202 **(LA-UR—86-3786) The evaluation and application of redundant-cross-section covariances.** Muir, D.W. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 8p. (CONF-861193—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002917.

From IAEA specialists' meeting on covariance methods and practices in the field of nuclear data; Rome, Italy (17 Nov 1986).

Certain multigroup covariance libraries, notably COVFILS-2, omit all redundant (or summed) reactions on the grounds that the information content of a well-measured total cross section, for example, is implicitly contained in the covariances of the component, or partial, reactions that add up to the total. It is shown that, while redundant reactions can play an important role in cross-section and covariance evaluation, their emission from libraries intended for applications is justifiable. 3 refs.

6511 Experimental Techniques

REFER ALSO TO CITATION(S) 16625

17203 **(CONF-8610239—1) Nuclear physics with internal targets in electron storage rings.** Holt, R.J. (Argonne National Lab., IL (USA)). 24 Oct 1986. Contract W-31109-ENG-38. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87004959.

From Symposium celebrating 35 years of electron scattering in nuclear and particle science; Urbana, IL, USA (23 Oct 1986).

Two key experiments in nuclear physics will be discussed in order to illustrate the advantages of the internal target method and demonstrate the power of polarization techniques in electron scattering studies. The progress of internal target experiments will be discussed and the technology of internal polarized target development will be reviewed. 43 refs., 11 figs.

6512 Nuclear Properties And Reactions, A=1-5, Experimental

17204 **(CEA-CONF—8542) Measurement of the muon capture rate in liquid deuterium by the lifetime technique.** Martino, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Jul 1986. 3p. (CONF-860741—19; CEA-DPH-N-S—2364). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750463.

From International symposium on weak and electromagnetic interactions in nuclei; Heidelberg, F.R. Germany (1 Jul 1986).

A new measurement was performed at Saclay in ultra-pure liquid deuterium and the neutron detection difficulties have been avoided by using the lifetime technique. Comments on the results are given.

17205 **(CEA-CONF—8546) Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV.** Alard, J.P.; Augerat, J.; Babinet, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Aug 1986. 2p. (CONF-860802—4-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750469.

From International nuclear physics conference; Harrogate, UK (25 Aug 1986).

Published in summary form only.

17206 **(CONF-8610196—5) Variational Monte Carlo calculations of few-body nuclei.** Wiringa, R.B. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004933.

From European workshop on few body physics; Rome, Italy (7 Oct 1986).

The variational Monte Carlo method is described. Results for the binding energies, density distributions, momentum distributions, and static longitudinal structure functions of the ^{3}H, ^{3}He, and ^{4}He ground states, and for the energies of the low-lying scattering states in ^{4}He are presented. 25 refs., 3 figs.

17207 **(LBL—22560) Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research].** Breunlich, W.H.; Cargnelli, M.; Bistirlich, J.; Crowe, K.M.; Justice, M.; Kurck, J.; Petitjean, C.; Sherman, R.H.; Bossy, H.; Daniel, H. (Lawrence Berkeley Lab., CA (USA); Oesterreichische Akademie der Wissenschaften, Vienna; Schweizerisches Inst. fuer Nuklearforschung, Villigen; Los Alamos National Lab., NM (USA); Technische Univ. Muenchen, Garching (Germany, F.R.). Physikdepartment). Sep 1986. Contract AC03-76SF00098. 39p. (CONF-8609135—7). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004475.

From International symposium on muon-catalyzed fusion; Tokyo, Japan (1 Sep 1986).

Important topics concerning Muon Catalyzed Fusion were investigated in experiments at the Swiss Institute for Nuclear Research (SIN), including transient and steady state rates for the main dμt cycle as well as detailed information about the competing dμd and tμt fusion branches. The basic kinetic parameters were determined and striking features of the resonant dμt formation process were revealed (density effect, epithermal behavior). DT sticking was measured with independent techniques, i.e., detection of fusion neutrons as well as μHe x-rays after fusion. Fusion yields per muon of 113 +- 10 were observed at liquid conditions, yields exceeding 200 are anticipated for optimal conditions from our results. 43 refs., 8 figs., 3 tabs.

6513 Nuclear Properties And Reactions, A=6-19, Experimental

17208 **(CEA-CONF—8468) Fragmentation of the projectile near the Fermi energy.** Dayras, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). May 1986. 17p. (CONF-860506—9; CEA-DPH-N-S—2352). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750449.

From International conference on heavy ion nuclear collisions in the Fermi energy domain; Caen, France (12 May 1986).

The experimental data about projectile fragmentation around the Fermi energy are reviewed. Comparisons with low and high energy data suggest that this energy domain is indeed a transition region. Reaction mechanisms dominated by the mean field at low energy progressively give way to individual n-n collisions. In the present case, this transition manifests itself by a rapid decrease of transfer reactions for the benefit of fragmentation processes. A coherent description of the observed results requires to take into account mean field effects as well as individual n-n collisions.

17209 **(DOE/ER/10420—8) Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987.** Prosser, F.W. (Kansas Univ., Lawrence (USA). Dept. of Physics and Astronomy). Jan 1987. Contract AC02-79ER10420;W-31109-ENG-38. 46p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005092.

The analysis of the fusion-evaporation cross section for $^{24}Mg + ^{24}Mg$ has been completed. As with other symmetric heavy-ion systems, this cross section appears to follow the prediction of a limitation imposed by the onset of fission. Much time has been spent on investigations of target-projectile systems leading to the ^{56}Ni compound nucleus, $^{16}O + ^{40}Ca$, $^{32}S + ^{24}Mg$, and $^{28}Si + ^{28}Si$. Status reports on earlier experiments in the final stages of analysis or being prepared for publication are given, as well as a description of a recent experiment on $^{16}O + ^{40}Ca$ at 15 MeV/A. In this experiment, coincidences between light nuclei and heavy residues and between pairs of heavy residues were obtained, as well as inclusive spectra of heavy residues and of complex light nuclei. A continuation of the search for production of n-p pairs emitted from fusion reactions in the $^1S_0$ deuteron state is reported. While this search is still unsuccessful, interesting information about the emission of nucleons from the ^{28}Si compound nucleus has been obtained. An investigation of incomplete fusion, using ^{12}C on heavy targets from ^{90}Zr to ^{197}Au, has been extended to ATLAS energies. While the initial run was not very successful, some useful data were obtained and a future run is planned. Efforts in the development and improvement of scintillation detectors for identification of Z = 1 and 2 nuclei from heavy-ion interactions have continued. 37 refs., 13 figs., 2 tabs.

17210 **(INS—550) Measurements of interaction cross sections and nuclear radii of Li isotopes.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Aug 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701314.

Interaction cross sections(σ sub(I)) for all known Li isotopes (/sup 6/Li - /sup 11/Li) and /sup 9/Be on targets Be, C, and Al have been measured at 790 MeV/nucleon. Nuclear radii(R sub(I)) of these isotopes have been deduced from the σ sub(I). The differences of radii among isobars(/sup 6/He - /sup 6/Li, /sup 8/He - /sup 8/Li, and /sup 9/Li - /sup 9/Be) have been found for the first time. A comparison of R sub(I) with the rms radii obtained from electron-scattering is presented.

17211 **(JINR—E-1-85-861) γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem.** Cheplakov, A.P.; Chubarian, M.Y.; Gasparian, A.P.; Grigalashvili, N.S. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700775.

Peripheral interactions of /sup 12/C nuclei with protons and carbon nuclei have been investigated in a 2m-propane bubble chamber at 4.2 GeV/c per nucleon. Energetic and angular characteristics of γ-quanta accompanying the production of multicharged fragments with Zsub(f)=5 and 6 have been analyzed. It is shown that in the fragment rest system there is an excess of γ-quanta with Esub(γ) < 40 MeV over the background from known sources (π/sup 0/ -> 2γ decays, bremsstrahlung and so on). 11 refs.

17212 **Observation of energetic protons in coincidence with pion-induced double charge exchange on /sup 12/C and /sup 48/Ca.** Morris, C.L.; Jones, K.W.; McGill, J.A.; Bryan, M.A.; Moore, C.F.; Gilman, R.; Glashausser, C.; Seestrom-Morris, S.J. (Los Alamos National Lab., NM, USA; Texas Univ., Austin, USA; Pennsylvania Univ., Philadelphia, USA; Rutgers - the State Univ., University Park, NJ, USA; Minnesota Univ., Minneapolis, USA). *Physics Letters [Section] B;* **182**: No. 2, 151-154(18 Dec 1986).

Angular distributions of recoil protons in coincidence with the scattered pions from the reaction (π/sup +/,π/sup -/p) on targets of /sup 12/C and /sup 48/Ca are reported. The measurements were made at an incident pion energy of 250 MeV, for a scattered pion angle of 80/sup 0/ and energy of 139 MeV. The angular distribution of recoil protons is broader than expected from a model in which the reaction is assumed to proceed by two sequential pion charge-exchange scatterings from nucleons in a Fermi gas.

6514 Nuclear Properties And Reactions, A=20-38, Experimental

17213 **(FEI—1722) Measurement of inelastically scattering neutron spectra from the (n,n'γ) reaction on iron nuclei.** Lychagin, A.A.; Devkin, B.V.; Zhuravlev, B.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1985. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700699.

The time-of-flight method was applied to measure spectrum of inelastically scattered neutrons in coincidence with 0.845 MeV γ-quanta at initial energy of neutrons equal to 14.1 MeV. Corrections necessary for processing experimental results and obtaining neutron from the reaction /sup 56/(n,n'γ)/sup 56/Fe are analyzed. 5 refs.; 7 figs.

17214 (INIS-mf—10558, pp 14) **Neutron scattering on light even-even nuclei.** Schmidt, D.; Seeliger, D. (Technische Univ., Dresden, German Democratic Republic). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17215 **(ITEF—191(1984)) Secondary particle multiplicity in the π/sup -/Ne interactions at psub(π)=6.2 Gev/c.** Kiselevich, I.L.; Kolesnikov, V.V.; Lapushkin, S.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700750.

Experimental data on multiplicity of secondary charged particles in π/sup -/Ne interactions at Psub(π)=6,2 GeV/c obtained by means of the 2 m neon-hydrogen ITEP bubble chamber are presented. Calculations of the model of multiple rescatterings are carried out. Comparison of experimental data with predictions of the model points out the necessity of additional accounting of cascade type process. 9 refs.; 3 figs.; 2 tabs.

6515 Nuclear Properties And Reactions, A=39-58, Experimental

17216 **(BNL-NCS—38907) Uncertainties in scientific measurements.** Holden, N.E. (Brookhaven National Lab., Upton, NY (USA)). 16 Nov 1986. Contract AC02-76CH00016. 11p. (CONF-861102—36). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004605.

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Some examples of nuclear data in which the uncertainty has been underestimated, or at least appears to be underestimated, are

reviewed. The subjective aspect of the problem of systematic uncertainties is discussed. Historical aspects of the data uncertainty problem are noted. 64 refs., 6 tabs.

17217 **(CENBG-R—8601) Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei.** Hubert, F.; Dufour, J.P.; Del Moral, R. (Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires). Jan 1985. 16p. (CONF-850173—17). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750476.

From 23. international winter meeting on nuclear physics; Bormio, Italy (21 Jan 1985).

Radioactive studies of light neutron rich exotic nuclei have been performed on the LISE line at GANIL. These isotopes were produced via projectile nuclear fragmentation of 60 MeV/nucleon ^{40}Ar on Be. Physical separation of the nucleides was achieved through the Projectile Fragment Isotopic Separation (PFIS) method (magnetic analysis and differential stopping power effects). At least 8 nuclei were observed for the first time through β-γ coincidence measurements (^{40}S, ^{36}P, ^{37}P, ^{36}Si, ^{35}Si, ^{34}F, ^{23}O) as well as already known half-lives to provide a check of the procedure (^{36}P, ^{30}Mg, ^{32}Al).

17218 **(CRN-PN—84-44) Coulomb displacement energies between analog levels for 44 < = A < = 239.** Antony, M.S.; Britz, J.; Pape, A. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). Aug 1985. 41p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750454.

Experimental Coulomb displacement energie ΔEsub(C) between isobaric analog levels are tabulated for 44 <- A <- 239, extending recent work in which similar data were presented for 3 <- A <- 45. An overall parametrization in anti-Z/A sup(1/3) and uniform radius parameters rsub(o) are given.

17219 **(GANIL-P—86-02) Search for impact parameter dependence of two-particle correlations using exclusive observables in nucleus-nucleus collisions at intermediate energies.** Ardouin, D.; Delagrange, H.; Doubre, H. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)). Jan 1986. 22p. (CONF-860160—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750584.

From 14. international workshop on the gross properties of nuclei and nuclear excitation; Hirschegg, Austria (13 Jan 1986).

The present analyzing status of two light particle correlations combined with exclusive observables from argon induced reactions on gold and titanium targets at 60 MeV/A.

17220 (INIS-mf—10558, pp 15) **/sup 52/Cr(n,xnγ)reactions at 14.6 MeV studied by coincident in-beam techniques.** Hlavac, S.; Oblozinsky, P.; Pivarc, J. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17221 (INIS-mf—10558, pp 17) **Analog giant dipole excitation in /sup 58/Ni(n,p)/sup 58/Co reaction at 17.3 MeV neutron energy.** Rondio, J.; Marianski, B.; Czerski, K.; Korman, A.; Zemlo, L. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17222 **Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements.** Wohlfahrt, H.D.; Shera, E.B.; Hoehn, M.V.; Yamazaki, Y.; Steffen, R.M. (Los Alamos Scientific Lab., NM). *Physical Review [Section] C: Nuclear Physics;* **23**: No. 1, 533-548(Jan 1981).

Precise 2p-1s muonic x-ray transition energies and energy shifts were measured for the 1integral/sub 7/2/-shell nuclei /sup 39,41/K, /sup 40,42,43,44,46,48/Ca, ^{45}Sc, /sup 46,47,48,49,50/Ti, ^{51}V, /sup 50,52,53,54/Cr, ^{55}Mn, and ^{56}Fe. The data were analyzed in terms of the Barrett moments <r/sup k/e$^-$/sup ar/> of the nuclear charge distribution, from which equivalent nuclear radii R/sub k/ and isotopic and isotonic differences ΔR/sub k/ were computed. For those nuclei for which electron-scattering data were available, model-independent rms radii and radius differences were deduced from a combined analysis of the present data and elastic electron-scattering data. The ΔN = 2 isotope shifts between even-A nuclei decrease nearly linearly with increasing N and become negative in the second half (24 ≦ N ≦ 28) of the 1integral/sub 7/2/ shell; a strong shell-closure effect is evident at N = 28. The isotope shifts are independent of Z, suggesting that the added neutrons interact with the entire proton core rather than with the valence protons. The ΔZ = 2 isotone shifts between even-A nuclei decrease smoothly and uniformly with increasing Z for 20 ≦ Z ≦ 28 and are essentially independent of N. Like the isotope shifts, the isotone shifts display a sudden increase at Z = 28. Both the ΔN = 1 isotope shifts and the ΔZ = 1 isotone shifts show pronounced odd-even staggering. A strong correlation is found between nuclear deformation, as revealed by experimental B(E2) values, and the measured isotope and isotone shifts. The measured isotope and isotone shifts, including those for odd-A nuclei, are satisfactorily described by a simple empirical formula. The experimental results were compared with Hartree-Fock calculations; some calculations that include ground-state correlations display improved agreement with experiment through the inclusion of these deformation-related effects.

17223 **Muonic isotope shifts in the stable Ca nuclei.** Wohlfahrt, H.D.; Shera, E.B.; Hoehn, M.V.; Yamazaki, Y.; Fricke, G.; Steffen, R.M. (Los Alamos Scientific Lab., NM). *Physics Letters [Section] B;* **73B**: No. 2, 131-134(13 Feb 1978).

Precise isotope shifts of the 2p - 1s muonic transition energies for the stable Ca isotopes have been measured. Model-independent radius differences are derived from combined analysis of the present data and elastic scattering data. The precise new /sup 48-40/Ca isotope shift disagrees with Hartree-Fock predictions. 19 references, 2 figures, 2 tables.

17224 **Muonic isotope shifts in the even Fe nuclei.** Shera, E.B.; Ritter, E.T.; Rinker, G.A. Jr.; Bennett, M.J.; Perkins, R.B.; Wohlfahrt, H.D.; Fricke, G.; Wagner, L.K.; Kleinheinz, P.; Sheline, R.K.; Steffen, R.M. (Univ. of California, Los Alamos). *Physical Review Letters;* **34**: No. 9, 535-538(3 Mar 1975).

Isotope shifts of the 2s → 1s muonic transition energies in /sup 54, 56, 58/Fe have been measured. The results indicate that the charge radii of these isotopes vary approximately as A/sup 1/3/. Whereas spherical Hartree-Fock calculations can account for less than one third of the observed isotopes shifts, deformed Hartree-Fock results reproduce two thirds of the observed shifts. It is suggested that the remaining discrepancy is primarily due to neglected neutron-proton residual interactions. 7 references, 1 figure, 2 tables.

6516 Nuclear Properties And Reactions, A=59-89, Experimental

17225 **(IAE—4132/2) Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei.** Korsheninnikov, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1985. 32p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700706.

Data collection on the "hot spot" formation in nucleus-nuclear collisions and light particle emission from it is obtained. Some indications of the "hot spot" existence are received in the course of experimental data analysis - yield cross section of pre-equilibrium neutron escaping forward and spectra of light particles at backward angles. Calculations through the "hot spot" mechanism are compared with spectra. The forecast in respect to correlation experiment which may be considered as a critical one for the "hot spot" conception is drawn. 36 refs.; 7 figs.; 2 tabs.

17226 **(KIYI—85-31) Results of underground experiment of neutrinoless double beta-decay of /sup 76/Ge.** Zdesenko, Yu.G.; Kropivyanskij, B.N.; Kuts, V.N.; Nikolajko, A.S.; Tretyak, B.I. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700837.

The experiment is carried out in the underground laboratory in salt mine at the depth of 43 Om from the earth surface. Ge(Li) detector 35 cm/sup 3/ in volume is shielded by mercury, lead and polyethylene layers. The background level at energy of 2β-decay of /sup 76/Ge (2040.7 keV) is (1.7 +- 0.5) x 10/sup -4/ counts/h keV. The processing of data per 1478 hour measurements makes it possible to define that the half-life of 2β-decay of /sup 76/Ge at 68% confidence level is more than 1.1 x 10/sup 22/ years for neutrinoless mode. 17 refs.; 6 figs.; 3 tabs.

6517 Nuclear Properties And Reactions, A=90-149, Experimental

17227 **(CEA-CONF—8503) Evolution of the fusion like process around the Fermi energy.** Pollacco, E.C.; Cassagnou, Y.; Alarja, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). May 1986. 4p. (CONF-860506—10; CEA-DPH-N-S—2355). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750589.

From International conference on heavy ion nuclear collisions in the Fermi energy domain; Caen, France (12 May 1986).

The study of evaporation residue from the Ne + Ag system shows that there is qualitative change in the reaction mechanism in the Fermi energy domain. At 20 MeV/u the projectile is mostly absorbed by the target, while at 30-37 MeV/u a continuous range of mass transfer with a large transverse momentum is observed.

17228 **(CENBG—8528) Structure effects in (n,α) reactions on Nd and Zr isotopes.** Augustyniak, W.; Glowacka, L.; Jaskola, M.; Turkiewicz, J.; Zemto, L.; Gadioli, E.; Gadioli Erba, E.; Dalmas, J. (Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires). 1985. 7p. (CONF-8506120—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750451.

From 4. international conference on nuclear reaction mechanisms; Varenna, Italy (10 Jun 1985).

The investigation of effects related to the structure of nuclei in (n,α) reactions might provide useful information for elucidating the reaction mechanism. In this article are presented studies on (n,α) processes on ^{143}Nd^{144}Nd and on ^{90}Zr^{91}Zr.

17229 **(INIS-mf—10282) Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin.** Gillitzer, A. (Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet fuer Physik). 23 Jul 1985. 81p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750523.

With a 250-MeV /sup 58/Ni beam at the post-accelerator SchweIN /sup 58/Ni, /sup 54/Fe, and /sup 50/Cr targets were irradiated. In the reaction with /sup 58/Ni delayed protons in a line at an energy of (0.98 +- 0.08) MeV were observed with a half-line of (33 +- 77) μs. In the irradiation of the /sup 54/Fe target a further delayed proton line was found for which an energy of (0.83 +- 0.08) MeV and a half-life of (109 +- 17) μs was measured. The intensity of the proton lines corresponds to nearly equal production cross sections of 30 μb respectively 40 μb. In the reaction /sup 58/Ni+/sup 50/Cr in a sensitive energy range between 0.5 MeV and 1.5 MeV at an experimentally accessible window in the half-life between about 10 ns and 5 s no delayed protons were observed. Thereby a detection limit of 0.5 μb was reached. The proton radioactivities were because of the analysis of the Q/sub p/-value systematics, the quantity of the cross sections, and the comparison of the results of all three reactions assigned to the residual nuclei of the (p2n) evaporation channel /sup 113/Cs respectively /sup 109/I. For /sup 105/Sb under the condition of a pure d/sub 5/2/ ground state a range between 0.55 and 1.1 MeV in the decay energy could be excluded.

17230 (INIS-mf—10558, pp 27) **Temperature shift of neutron resonances.** Ignatovich, V.K.; Meister, A.; Mittag, S.; Pilz, W.; Seeliger, D.; Seidel, K. (Joint Inst. for Nuclear Research, Dubna, USSR; Technische Univ., Dresden, German Democratic Republic). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

6518 Nuclear Properties And Reactions, A=150-189, Experimental

17231 (INIS-mf—10558, pp 18) **Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy.** Al-Janabi, T.; Kadhim, A.B. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17232 **(JINR—6-84-819) Probabilities of electromagnetic transitions in odd thulium nuclei.** Adam, I.; Alikov, B.A.; Askarkhodzhaev, A.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700765.

Submitted to the journal Bull. Acad. Sci. USSR, Phys. Sci. .

Lifetimes of /sup 165/Tm excited states at 129.9, 315.5, 362.3 and 419.8 keV have been measured by means of delayed $\gamma\gamma$-coincidences in the /sup 165/Yb decay. The following half-lives unknown so far were obtained: Tsub(1/2) (129 keV) $<=$0.2 ns, Tsub(1/2) (315 keV)=0.25(10) ns, Tsub(1/2) (362 keV)$<$0.2 ns and Tsub(1/2) (419 keV)$<=$0.1 ns. Probabilities of M1, E2, E1 intra- and interband γ-transitions have been obtained on the basis of the known from literature obtained on the excited states of Tm isotopes. Behaviour of probabilities of M1, E2 and E1 transitions in Tm isotopes has been analysed in adiabatic approach for ground state bands, and also within the framework of the nonadiabatic description of electromagnetic transition probabilities. The influence of pairing correlations on probabilities of E1(ΔK=0) transitions has been discussed as well as the role of K-mixing in calculations of K-forbidden E1(ΔK=3) transitions. Results of the analysis has shown that it is possible to describe rather well a great number of resolved and K-forbidden electromagnetic transitions in the framework of the nonadiabatic rotational model. Consideration of quasiparticle-phonon interaction allows one to improve appreciably agreement of the results with the experiment. 36 refs.; 5 figs.; 9 tabs.

6519 Nuclear Properties And Reactions, A=190-219, Experimentnl

17233 **(CEA-CONF—8547) Giant resonance excitation by inelastic scattering of medium energy ^{13}C ions.** Arvieux, J.; Bonin, B.; Bruge, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Aug 1986. 2p. (CONF-860802—3-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750468.

From International nuclear physics conference; Harrogate, UK (25 Aug 1986).

Published in summary form only.

17234 **(CENBG—8602) Two-particle correlations in ^{40}Ar + ^{197}Au at 60 MeV/A.** Quebert, J. (Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires). Jan 1986. 18p. (CONF-860158—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750452.

From 25. international meeting on nuclear physics; Bormio, Italy (20 Jan 1986).

Two-particle correlations have been measured at GANIL with a multidetector array of 21 telescopes (a part of which was set-up in a close-packed geometry). Simultaneously a plastic wall, made of 96 scintillators, set-up at foward angles, was triggered

either by coincidence events or single events. The correlation functions R, are measured for different sets of light particles. They are also studied versus collective data given by the plastic wall detection of each event. We deduce different informations concerning the spatial extent of the emitting source, as well as the population of particle unstable states of light nuclei.

17235 **(CONF-8605150—3) High-spin states and coexisting states in the Pt-Au transition region.** Riedinger, L.L.; Carpenter, M.P.; Courtney, L.H.; Janzen, V.P.; Schmitz, W. (Tennessee Univ., Knoxville (USA)). 1986. Contract AS05-76ER04936. 7p. NTIS, PC A02. File Number DE87005498.

From Beijing symposium on physics at tandem; Beijing, China (26 May 1986).

High-spin states in the N = 104 to 108 region have been studied by in-beam spectroscopy techniques in a number of Ir, Pt, and Au nuclei. These measurements have been performed at tandem Van de Graaff facilities at the Oak Ridge National Laboratory and at McMaster University. Through comparison of band crossings in a variety of odd-A and even-A nuclei, we are able to assign the first neutron and first proton alignment processes, which are nearly degenerate for ^{184}Pt. These measurements yield the trend of these crossing frequencies with N and Z in this region. Knowledge of this trend is important, since these crossing frequencies can give an estimate of how the shape parameters vary across this transitional region. 22 refs., 7 figs., 1 tab.

17236 **(GANIL-P—86-12) Multiplicity dependent light particle correlations in ^{40}Ar + ^{197}Au reaction at E/A = 60 MeV^0.** Kyanowski, A.; Saint-Laurent, F.; Ardouin, D. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750582.

Correlations between light particles in ^{40}Ar induced reactions on ^{197}Au at E/A = 60 MeV have been measured in coincidence with a multidetector system. The correlations decrease monotonously with increasing charged particle multiplicity. With the help of a participant-spectator model, this multiplicity is tentatively connected to the impact parameter. The correlation function is analyzed in the framework of the final state interaction model in order to extract the space-time extent of the emitting source.

17237 (INIS-mf—10558, pp 13) **Neutron emission from lead bombarded with 14 MeV neutrons.** Elfruth, T.; Hermsdorf, D.; Kalka, H.; Seeliger, D.; Seidel, K.; Unholzer, S. (Technische Univ., Dresden, German Democratic Republic). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17238 **(ITEP—118(1985)) Correlations between neutrons with small relative momenta produced in p-Pb interactions at 7,5 GeV/c.** Bayukov, Yu.D.; Degtyarenko, P.V.; Efremenko, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700752.

Correlations between neutrons with small relative momenta have been studied in p-Pb interactions at 7.5 GeV/c. The 10-100 MeV neutrons emerging at the angles of 75-90 degrees with respect to the beam direction were recorded. Two-neutron final-state interaction effect carrying information about space-time characteristics of a neutron source has been observed. Magnitude of the effect has been found to depend on the mean neutron momentum in the pair. As the spatial extent of the neutron source is assumed to be limited by the size of the target nucleus, the source lifetime has been found to decrease with the increasing mean neutron momentum. This fact is explained by considerable contribution of the evaporation process to the emission of slow secondaries. 21 refs.; 3 figs.

6520 Nuclear Properties And Reactions, A=220 And Above, Experimental

17239 **(BNL—38491) Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu.** Zucker, M.S.; Holden, N.E. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 36p. (CONF-860610—34). NTIS, PC A03/MF A01; GPO Dep. File Number DE86015078.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Certain applications require knowledge of the higher moments of the neutron multiplicity probability. It can be shown that the second factorial moment is proportional to the fission rate in the sample, and that the third factorial moment can be of use in disentangling spontaneous fission from induced fission. Using a source of unpublished work in which neutron multiplicities were derived for the fast neutron induced fission of U-235, U-238, and Pu-239, the multiplicity probability has been calculated as a function of neutron energy for the energy range 0 to 10 MeV. (DWL)

17240 **(CEA-CONF—8439) Formation and decay of hot nuclei.** Cassagnou, Y.; Conjeaud, M.; Dayras, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Mar 1986. 9p. (CONF-860396—15; CEA-DPH-N-S—2344). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750475.

From Symposium on the many facets of heavy ion fusion reactions; Argonne, IL, USA (24 Mar 1986).

The aim of the present investigation is to determine the entrance channel conditions to form nuclei as hot as possible and also to study their decay properties. The experiment has been realised at the GANIL facility using ^{14}N, ^{40}Ar, and ^{58}Ni projectiles at intermediate energies and with beam intensities ranging from 100 to 500 nA. The technique we used to determine the linear momentum imparted to the target nucleus is the angular correlation of the fission products, whereas energies deposited in nuclei were deduced from the measurement of masses and velocities of both fission fragments. In summary, important amount of momentum transfers and excitation energies have been imparted to composite-like-nuclei with A approximately 270. A scaling for momentum transfer with the projectile mass is evidenced up to the Ni ions for central collisions. Velocity and size of projectiles play an important role as well as excitation energies deposited in fissioning nuclei, in fixing the central collision cross sections. Finally, high relative velocities of fission fragments have been measured and open an interesting problem on the fission properties of nuclei at high excitation energies and angular momenta.

17241 **(CEA-CONF—8440) Formation and decay of hot nuclei.** Mostefai, M.; Cassagnou, Y.; Conjeaud, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). May 1986. 4p. (CONF-860506—8; CEA-DPH-N-S—2347). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750448.

From International conference on heavy ion nuclear collisions in the Fermi energy domain; Caen, France (12 May 1986).

Fission fragment angular correlations for the system ^{58}Ni + ^{232}Th at 20, 25 and 30 MeV/u show still a bump for large momentum transfers which suggest that its disappearance for the ^{40}Ar + ^{232}Th system at 44 MeV/u is not due to a limitation in the excitation energy and that the size and velocity of projectiles are also important. High relative velocities of fission fragments are measured for large transfers (approximately 9.5 GeV/c), this could be due to more exotic fission of hot nuclei.

17242 **(CONF-8609159—6) Competition between fusion and quasi-fission in heavy ion induced reactions.** Back, B.B. (Argonne National Lab., IL (USA)). Sep 1986. Contract W-31109-ENG-38. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004983.

From International school-seminar on heavy ion physics; Dubna, USSR (23 Sep 1986).

Quantitative analyses of angular distributions and angle-mass correlations have been applied to the U + Ca reaction to obtain upper limit estimates for the cross sections for complete fusion near or below the interaction barrier. Extrapolating to the systems Ca + Cm and Ca + Es using the well established scaling properties of the extra push model, an estimate of the cross sections relevant to the efforts of synthesizing super-heavy elements in the region Z = 116 and N = 184 via heavy-ion fusion reactions are obtained. A simple evaporation calculation using properties of the super heavy elements shows that the failure to observe super-heavy elements with the Ca + Cm reaction is consistent with estimates of the complete fusion process. 33 refs., 9 figs., 1 tab.

17243 (GANIL-P—86-09) **Fusion with projectiles form carbon to argon at energies between 20A and 60A MeV.** Galin, J. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)). Mar 1986. 28p. (CONF-860396—16). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750583.

From Symposium on the many facets of heavy ion fusion reactions; Argonne, IL, USA (24 Mar 1986).

A review of the linear momentum transfer is made, considering essentially heavy targets and two important parameters in the entrance channel: the projectile energy and its mass. Over a broad mass range, and for energies up to 30A MeV, the momentum transfer scales with the mass of the projectile. At 30A MeV, the most probable value of projectile momentum transferred to the fused system is 80%, and this represents roughly 180 MeV/c per projectile nucleon. At higher bombarding energies, the momentum distribution in the fused systems, as observed from binary fission events, seems to depend on the mass of the projectile. Further studies are still needed to understand this behaviour. Finally, the decay of highly excited (E^* approximately 500-800 MeV) fused systems, with masses close to 270 amu, is studied from the characteristics of both fusion fragments and light charged particles. It is shown that thermal equilibrium is reached before fission, even for such high energy deposition. However, the decay sequence is sensitive to dynamical effects and does not depend only on available phase space.

17244 (INIS-mf—10558, pp 28) **Measurement and evaluation of nuclear data for nuclear power application.** Kuz'minov, B.D.; Manokhin, V.N.; Sal'nikov, O.A. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17245 (INIS-mf—10558, pp 19) **Differential study of / sup 252/Cf(sf) neutron emission.** Maerten, H.; Richter, D.; Seeliger, D.; Fromm, W.D.; Neubert, D. (Technische Univ., Dresden, German Democratic Republic; Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden, German Democratic Republic). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17246 (INIS-mf—10558, pp 21) **/sup 235/U(n,f) fragment mass, kinetic energy and angular distributions at energies below 6 MeV - results and interpretation.** Straede, Ch.; Budtz-Joergensen, C.; Knitter, H.-H. (Commission of the European Communities, Geel, Belgium. Central Bureau for Nuclear Measurements). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17247 (INIS-mf—10558, pp 22) **Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes.** Schillebeeckx, P.; Wagemans, C.; Deruytter, A.J. (Ghent Rijksuniversiteit, Belgium. Lab. voor Kernfysica; Commission of the European Communities, Geel, Belgium. Central Bureau for Nuclear Measurements). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17248 (INIS-mf—10558, pp 23) **Energy dependence peculiarities of fragment mean kinetic energy at nuclei fission by neutrons.** Goverdovskij, A.A.; Kuz'minov, B.D.; Mitrofanov, V.F.; Sergachev, A.I. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17249 (INIS-mf—10558, pp 24) **Thermal neutron fission cross-sections of /sup 236/Np isomers.** Selitskij, Yu.A.; Funshtejn, V.B.; Yakovlev, V.A. (Radievyj Inst., Leningrad, USSR). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17250 (INIS-mf—10558, pp 25) **Experimental study of γ-ray emission from neutron resonance fission of /sup 235/U.** Kliman, J.; Duka-Zolyomi, A.; Gundorin, N.; Kristiak, J. (Joint Inst. for Nuclear Research, Dubna, USSR; Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17251 (INIS-mf—10558, pp 26) **Chemical shifts of uranium neutron resonances.** Meister, A.; Mittag, S.; Pilz, W.; Seeliger, D.; Seidel, K.; Pikel'ner, L.B. (Technische Univ., Dresden, German Democratic Republic; Joint Inst. for Nuclear Research, Dubna, USSR). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17252 (KIYI—85-35) **Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters.** Litvinskij, L.L.; Libman, V.A.; Murzin, A.V. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 40p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700839.

A setup for neutron scattering and total cross-section measurements by using high flux filtered reactor beams was created at the WWR-M reactor of the Institute for Nuclear Research in Kiev. Scattering neutrons are detected by a hydrogen proportional proton recoil counter. Total neutron cross-sections are measured by transmission. The measured total neutron cross-sections of carbon, lead and uranium-238 at 55 keV, 144 keV neutron energy are given. Filtered neutrons were got by means of silicon filter. Total and differential neutron scattering cross-sections of /sup 238/U both elastic and inelastic at 144 keV neutron energy are given. 5 figs.; 15 figs.; 1 tab.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 16952, 17181, 17190, 17193, 17201, 17649

17253 (CEA-CONF—8318) Static and dynamic aspects of nuclear matter distribution: microscopic calculations and experimental data. Girod, M. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Nov 1985. 14p. (In French). (CONF-851157—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750439.

From Specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV; Paris, France (13 Nov 1985).

During the past ten years, a large amount of experimental data has been accumulated which gives information with regard to the sizes of the nucleus and the distribution of nuclear matter. Some particularly relevant results are presented. From a theoretical point of view, the contribution of the microscopic models is shown and particularly the results obtained by Hartree-Fock (HF) and Hartree-Fock-Bogoliubov (HFB) methods using D1 effective interaction. The limitations of static calculations are also shown making necessary to take into account the dynamical effects, especially in shape transition regions. The densities obtained by the HF + RPA and HFB + Bohr hamiltonian theories are presented and compared to the experimental results.

17254 (CNIC—00006) Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory. (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 12p. (In Chinese). (IAE—0006). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701276.

The reaction cross sections of neutron on /sup 10/B, /sup 11/B were calculated by using optical model and Hauser-Feshbach theory. The total cross sections, elastic scattering cross sections and angular distributions, the inelastic scattering cross sections and angular distributions of low excitation state of the 9.72 MeV neutrons on /sup 10/B and 9.97, 12.06, 14.10, 18.12 MeV neutrons on /sup 11/B, and the reaction cross sections and angular distribution of (n, p), (n, d), (n, t) and (n, α) reactions, as well as the branching ratio of /sup 11/B(n, α/sub 0/) /sup 8/Lisub(g. s.) and /sup 11/B(n, α/sub 1/) /sup 8/Lisub(ist) were obtained. The optical parameters of α particles on the short-life /sup 8/Li were deduced. The calculation results were compared with the experimental data.

17255 (CNIC—00007) Measurement of thermal-neutron-induced /sup 235/U fission spectrum by threshold detectors. (China Nuclear Information Centre, Beijing, BJ). Apr 1986. 13p. (In Chinese). (IAE—0007). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701277.

The unfolding spectrum capacity of SAND-II and RDMM methods was investigated using threshold detectors to determine the thermal neutron induced /sup 235/U fission spectrum. A Monte Carlo error analysis code was used to analyse the input data errors. The errors of solution uniqueness for SAND-II and the effect of the weighting function for RDMM have been discussed. The sensitivity of both methods for the structure of the unknown spectra has been tested briefly. The results showed that SAND-II and RDMM are better methods for determinating the fast neutron spectra with smooth variation. The SAND-II is more suitable for unknown spectra with simple structure.

17256 (CONF-861193—4) Covariances for measured activation and fission ratios data. Smith, D.L.; Meadows, J.W.; Watanabe, Y. (Argonne National Lab., IL (USA)). 1986. Contract W-31109-ENG-38. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004748.

From IAEA specialists' meeting on covariance methods and practices in the field of nuclear data; Rome, Italy (17 Nov 1986).

Methods which are routinely used in the determination of covariance matrices for both integral and differential activation and fission-ratios data acquired at the Argonne National Laboratory Fast-Neutron Generator Facility (FNG) are discussed. Special consideration is given to problems associated with the estimation of correlations between various identified sources of experimental error. Approximation methods which are commonly used to reduce the labor involved in this analysis to manageable levels are described. Results from some experiments which have been recently carried out in this laboratory are presented to illustrate these procedures. 13 refs., 1 fig., 5 tabs.

17257 (CONF-8610164—2) Neutron scattering on nuclei near A = 60 and A = 90. Lawson, R.D.; Smith, A.B. (Argonne National Lab., IL (USA)). 10 Oct 1986. Contract W-31-109-ENG-38. 26p. NTIS MF A01; 2; GPO Dep. File Number DE87004962.

From International Atomic Energy Agency conference; Bologna, Italy (6 Oct 1986).

Over a wide range of incident energies, the total cross section and angular distributions for elastic scattering of neutrons from nuclei in these mass regions are analyzed using the spherical-optical-statistical model. The effect of a real-surface-peaked potential, predicted by dispersion relations, is considered. It is found that when the data on a given nucleus between say, 4.5 and 10 MeV, are analyzed simultaneously one obtains a smooth energy variation of the optical model parameters. Moreover, this parameterization may be used to predict, quite accurately, at least the total cross sections up to 20 MeV. The parameters characterizing the model are quite different in the two mass regions. However, a comparison of the optical model results for (^{89}Y and ^{93}Nb indicates that near A = 90 the real well parameters are nearly the same for the two nuclei and that the volume integrals of the imaginary potentials are similar. 16 refs., 9 figs., 2 tabs.

17258 (DOE/ER/40154—3) Research in theoretical nuclear physics: Annual report, 1985/1986. Liu, K.F. (Kentucky Univ., Lexington (USA)). 1986. Contract FG05-84ER40154. 24p. NTIS, PC A02. File Number DE87005520.

Investigations are proposed in the following areas: Chiral soliton description of hadron physics, Monte Carlo lattice gauge simulation, detection of quark gluon plasma in relativistic heavy ion collisions, phenomenology of exotic mesons and fermi-liquid theory of nuclei. An effective σ model lagrangian is used to study the nucleon static properties, the NN static potential and the baryon spectrum with vibration and rotation coupling in πN scatterings. In the projects involving Monte Carlo calculations, plans are made to evaluate the vacuum to glueball transition amplitudes and the nucleon form factors in the physical SU(3) case. Calculations are made of the ionization and regeneration rates of various high mass mesons to examine a proposal of detecting the quark gluon plasma via di-leptons and quadra-leptons. Efforts continue in searching for exotic mesons (Q^2 anti Q^2 mesons and glueballs in $\gamma\gamma$ reactions, hadronic collisions, J/psi radiative decays and anti NN annihilations. Last but not least, a proposal is made to employ a new Skyrme interaction to study the spin modes in nuclei, the particle-particle interactions, the optical potentials and carry out the renormalized random phase approximation calculations via particle-phonon coupling mechanism. 73 refs., 1 fig.

17259 (EFI—781(8)-85) Electron scattering from light nuclei in the regions of quasi-elastic peak and Δ-isobar excitation. Aznauryan, I.G.; Troshenkova, I.A. (Erevanskij Fizicheskij Inst. (USSR)). 1985. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700676.

The cross sections of the (e,e') reaction on nuclei are considered in the identical form for the quasi-elastic electron scattering and the quasi-free pion electroproduction. The cross sections on single nucleon in the Δ-isobar excitation region are obtained using the dispersion relations being in good agreement with the experiment. A consistent set of parameters for the shell model with the oscillator potentials is obtained for Li, Be, C, Mg, Al and Si nuclei. The mean square radii of the nuclei charge distribution calculated with the use of these parameters agree with the rms obtained from the electron-nuclei elastic scattering experiments. 20 refs.; 5 figs.

17260 **(GANIL-P—86-08) Particle emission but also fission in the decay of very excited nuclei.** Delagrange, H.; Gregoire, C.; Abe, Y.; Carjan, N. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750590.

An extension of the statistical model for the study of very excited nuclei is presented. The temperature and angular momentum dependences of the fission barriers are obtained in a liquid drop picture. It provides us with the relevant potential landscapes for some collective variables which evolve during the decay according to a generalized transport equation. The light particle evaporation during the fast fission process and the fission after compound nucleus formation is calculated and compared with some available experimental results, e.g. for $^{40}Ar + ^{238}U$ at 27 MeV/u. The competing process of particle emission (cooling) during the thermal equilibrium prevents a complete transfer of excitation energy along the whole evolution of the system. Such nuclei should be called warm instead of hot.

17261 **(GSI—86-32-Prepr.) Sub-barrier fusion.** Reisdorf, W. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Aug 1986. 23p. (CONF-860802—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750500.

From International nuclear physics conference; Harrogate, UK (25 Aug 1986).

Measured fusion excitation functions in the vicinity of the barrier reveal nuclear structure effects, due in particular to the coupling of the fusion process to direct-reaction channels.

17262 **(IFVE-OTF—85-112) Do multinucleon clusters exist in a nucleus.** Smirnov, A.Yu. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700728.

Submitted to the journal Pis'ma Yad. Phys. .

A Method of extracting nuclear constituent masses by compairing the structure functions of a nucleus and of a free nucleon is proposed. It is shown that the existing data do not confirm the significant admixture of multinucleon clusters in a nucleus. At the same time, these data do not contradict the nucleon color oscillation model. 3 refs.; 3 figs.

17263 (INIS-mf—10556-Vol.1, pp 76-83) **Dynamic symmetries in nuclei and molecules.** Iachello, F. (Yale Univ., New Haven, CT, USA. Wright Nuclear Structure Lab.). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

A survey is published of the use of the concepts of dynamic symmetries for the description of spectra of complex atomic nuclei and the description of molecular spectra. In nuclear physics the application is based on the interacting boson model (IBM). In molecular physics it is based on the so-called vibron model whose algebraic structure is similar to the IBM structure but whose physical interpretation is completely different (molecular spectra are characterized by dipole deformation, nuclear spectra by quadrupole deformation). The extension of these ideas is mentioned to comprise mixed systems of bosons and fermions in nuclear physics (odd nuclei) and in condensed matter physics (superconductivity). (S.P.).

17264 **(INIS-mf—10558) 4th international symposium on neutron induced reactions. The abstracts of contributed papers.** (Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav). Jun 1985. 37p. (CONF-850635—Absts.). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739.

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

Abstracts are published in the proceedings of 35 papers presented at the symposium. All have been inputted in INIS. The symposium dealt with experimental and theoretical studies of mechanisms of nuclear reactions induced by neutrons, with attention being devoted to fast neutron reactions, neutron capture and fission. Some communications were devoted to the experimental and methodological development of neutron physics, e.g., to detection systems, neutron sources, data analysis, etc. (S.P.).

17265 (INIS-mf—10558, pp 2) **Gamma-ray competition in continuum.** Antalik, R. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17266 (INIS-mf—10558, pp 3) **Exciton Model and multistep-compound reactions.** Kalka, H.; Hermsdorf, D.; Seeliger, D. (Technische Univ., Dresden, German Democratic Republic. Sektion Physik). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17267 (INIS-mf—10558, pp 6) **Method to determine the pairing energy for excited nuclei.** Rohr, G. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17268 (INIS-mf—10558, pp 8) **Particle-hole state densities for statistical multi-step compound reactions.** Oblozinsky, P. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17269 (INIS-mf—10558, pp 9) **Particle-hole level densities in the approximation of homogeneous spectrum of single particle levels.** Oblozinsky, P. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17270 (INIS-mf—10558, pp 10) **New results obtained by the number theoretical description of the level densities of nuclei.** Meneses, A. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17271 (INIS-mf—10558, pp 1) **Neutron reactions on Ti isotopes from near threshold to 20 MeV.** Gmuca, S. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17272 (INIS-mf—10558, pp 4) **Proton-channel related analysis of 14 MeV (n,xn)-reactions.** Jahn, H. (Kernforschungszentrum Karlsruhe G.m.b.H., Germany, F.R.). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17273 (INIS-mf—10558, pp 5) **Neutron-gamma coincidence calculations within the pre-equilibrium model.** Betak, E.; Dobes, J. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav; Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17274 (INIS-mf—10558, pp 7) **Isospin mixing during the decay of the Giant Dipole Resonance.** Ryckbosch, D.; Van Camp, F.; Van de Vyver, R.; Berkvens, P.; Kerkhove, E.; Van Otten, P.; Ferdinande, H. (Ghent Rijksuniversiteit, Belgium. Lab. voor Kernfysica). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17275 (INIS-mf—10558, pp 11) **Walkers, slaves or both?.** Betak, E. (Slovenska Akademia Vied, Bratislava, Czechoslovakia. Fyzikalny Ustav). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17276 (INIS-mf—10558, pp 12) **Neutron capture mechanism.** Ho, Y.K. (Zhengzhou University, Honan, China. Physics Department). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17277 (INIS-mf—10558, pp 16) **Nuclear level density from analysis of neutron spectra from (n,n') and (p,n) reactions.** Lovchikova, G.N.; Sal'nikov, O.A.; Simakov, S.P.; Trufanov, A.M. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17278 (INIS-mf—10558, pp 33) **Investigation of charge symmetry violation in d+d mirror reactions at low energies.** Bem, P.; Kozma, P.; Presperin, V.; Vincour, J.; Ad'yasevich, B.P.; Antonenko, V.G. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky; Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17279 (INIS-mf—10558, pp 34) **Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations.** Zhang Tian-Yuan. (Institute of Applied Physics and Computational Mathematics, Beijing, China). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17280 (INIS-mf—10558, pp 35) **On mechanisms of reaction /sup 9/Be(n,2n).** Du Xiangwan; Zhang Benai. Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17281 (INIS-mf—10558, pp 20) **Theoretical study of the /sup 252/Cf(sf) neutron spectrum.** Maerten, H.; Seeliger, D. (Technische Univ., Dresden, German Democratic Republic). Jun 1985. NTIS (US Sales Only), PC A03/MF A01. File Number DE87700739. (CONF-850635—Absts.).

From 4. international symposium on neutron induced reactions; Smolenice, Czechoslovakia (17 Jun 1985).

17282 (INIS-SU—370, pp 3-7) **Noneikonal effects in cross sections of proton reactions on nuclei.** Zavarzina, V.P. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Calculations of reaction cross sections under the action of protons on /sup 12/C, /sup 40/Ca, /sup 90/Zr, /sup 120/Sn, /sup 208/Pb nuclei are performed at 40-1000 MeV energies in the frame-fork of the optical model with provision for noneikonal effects. The obtained cross sections are compared with precise calculational results. Relative Coulomb correction is close to the W/E factor (where W is the Coulomb barrier), usually used for consideration of the Coulomb interaction contribution to reaction cross section. The results obtained show that nuclear noneikonal correction is to be taken into account along with the Coulomb one, in particular for intermediate mass nuclei.

17283 (INIS-SU—370, pp 49-52) **Quasi-free scattering of pions on nuclei in the region of Δ/sub 33/-resonance.** Zavarzina, V.P.; Sergeev, V.A.; Stepanov, A.V. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Differential cross sections of direct knock out of nucleons by pions and quasi-free scattering of pions on nuclei at enegries above Δ/sub 33/ resonance are calculated and compared with experimental values. Calculated cross sections describe available experimental data with provision for introduced approximations and also the errors, related to separation of contributions of direct knock out and quasi-free scattering from measured values. The mechanism of quasi-free scattering dominates (constitutes 65-70%) in the (π/sup +/π/sup +1/) inclusive reaction at Esub(π)=245 MeV for all nuclei under study, while the contribution of the processes of direct knock out decreases with A growth.

17284 (INIS-SU—370, pp 58-61) **Energy spectra of secondary electrons with E>100 MeV at altitudes of 300-500km for shells of L=2-4.** Kurnosova, L.V.; Razorenov, L.A.; Fradkin, M.I. 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Problem of secondary electrons energy spectra obtained from measurings at heights of 300-500 km for shell of L=2-4 is considered for the energy range of 100-1000 MeV. It is shown that there are some captured electrons forming under the action of primary cosmic rays at heights of 300-500 km in a rarefied medium. The flux of captured electrons is approximately equal to the albedo electron flux generated at stratosphere heights.

17285 (INS—553) **Isoscalar quadratic energy weighted sum rules and quadrupole moment of giant quadrupole resonance.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Aug 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701315.

Isoscalar sum rules homogeneous quadratic in energy weighting are derived for the electric multipole operators. Except for scaling factors the sum rule values for the pure quadrupole and monopole transitions are the same as that for the corresponding linear energy weighted sum rules. Through these sum rules the electric quadrupole moment of giant quadrupole resonance is found to be -2.7 Asup(1/3) efm/sup 2/.

17286 (ISN—84-47) Random phase approximation. Schuck, P. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). 1984. 41p. (CONF-840299—5). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750443.

From Winter school on fundamental nuclear physics; Trieste, Italy (7 Feb 1984).

I will therefore try to a large extent to concentrate on more formal aspects of the theory not treated in the standard literature. Numerical applications and comparison with experiments can also be found in the complementary lectures.

17287 (ITEP—154(1985)) Quarks degrees of freedom and deuteron static moments. Kalashnikova, Yu.S.; Narodetskij, I.M.; Veselov, A.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700755.

The probability of the six-quark bag part of the deuteron is defined within recently formulated quark compound bag (QCB) model.An upper limit of about 1% for admixture of the confined bag in the deuteron is found for the QCB potential supplied by the long range Paris interaction. The six-quark bag corrections to the static multipole moments of the deuteron are estimated to be < or approximately 1% for μsub(α) and < or approximately 6% for Qsub(d). 16 refs.; 4 figs.; 2 tabs.

17288 (ITP—85-117-E) Phenomenologic consideration of quark degrees of freedom in potential description approach. Petrov, N.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1985. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700762.

Potential description of an interaction in a system of two hadrons with their internal structure taken into account is discussed. The interaction parameters are estimated in the region of a compound quark bag. The problem of underboundness in few-nucleon systems and the scattering by resonance levels are discussed. 18 refs.; 1 fig.

17289 (JINR—E-2-85-748) Excitation of target residues in the firestreak model. Avdejchikov, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700777.

The nuclear firestreak model is used to calculate the excitation energy of residual nuclei in nucleus-nucleus collisions. The incorporation of diffuseness of interacting nuclei has introduced the dependece of nucleus excitation on the energy of the projectile. Viscosity of nuclear matter is also taken into account. "Nuclear thermometer" is proposed to measure the temperature of target residues. 27 refs.; 4 figs.

17290 (JINR—E-4-85-706) Quasiparticle-phonon nuclear model. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701329.

Submitted to the International school on nuclear structure (Alushta, 1985).

Basic assumption of the quasiparticle-phonon nuclear model (QPNM) and its two applications are presened. The introduction of tensor forces in the QPNM is described and the results of studying the fragmentation of charge-exchange resonances in spherical nuclei are given. The low-lying Ksup(π)=0sup(+), 2/sup +/, 3/sup +/ and 4/sup +/ states in doubly even deformed nuclei are described. The results calculated in the QPNM are compared with those obtained in the interacting boson model. 52 refs.; 4 figs.

17291 (JINR—E-4-85-728) Investigation of two-phonon pole shift in deformed nuclei by the boson expansion method. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701330.

Submitted to the journal Theor. Math. Phys. .

New phonons are constructed by the boson expansion method. The model Hamiltonian is expressed through the new phonon operators up to the forth order terms. The two-phonon pole shift is calculated. It coincides up to the main terms with that calculated with the phonons calculated in random phase approximation and strict inclusion of the Pauli principle. It is concluded that the two-phonon collective states in the even-even deformed nuclei are absent. 16 refs.

17292 (JINR—E-7-85-431) Half-lives and kinetic energies for the spontaneously emitted heavy ions from nuclei. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1985. 140p. NTIS (US Sales Only), PC A07/MF A01. File Number DE87701331.

The partial half-lives, branching ratios relative to the alpha-decay, kinetic energies and Q-values for the most probable spontaneously emitted heavy ions from 766 nuclides with Z=47-106 and total half-lives longer than 1 μs are estimated by using the analytical superasymmetric fission model, a semiempirical formula for α-decay life-time, which are not measured, and the Wapstra-Audi new mass tables. Even the so-called stable nuclides with Z>40 are metastable relative to the new decay modes. The experimental evidences are briefly reviewed. 43 refs.; 3 tabs.

17293 (JINR—R-7-86-6) Study of cluster emission by excited compound nuclei. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1986. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701166.

From Workshop on 4π-detector for Heavy ion reaction products (FOBOS installation); Dubna, USSR (1986).

Submitted to the journal Sov. J. Nucl. Phys. .

On the basis of the evaporation model calculations have been done for the cross sections of cluster formation in the decay of excited compound nuclei with Z = 49, 65, 80 and 97 formed in the reactions Ag + He/sup 3/ in the He/sup 3/ ion energy range between 50 and 130 MeV and in the reactions Arsup40 + Ag, Arsup40 + Sm(154) and Arsup(40) + Ausup(197) at an Arsup(40) ion energy of 336 MeV. The influence of various factors (shell effects in the level density, changes in the angular momentum and in the equilibrium deformation in cluster emission, etc) on the cluster emission cross section has been considered in detail. Good agreement between the calculated results and experimental data has been obtained without using the additional factors associated with the probability of cluster formation in compound nuclei. 15 refs.; 6 figs.

17294 (JINR-R—2-85-830) Statistical methods of the description of quark degrees of freedom. Baldin, A.M.; Shumovskij, A.S.; Yukalov, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700799.

An investigation of quark degrees of freedom by means of statistical-mechanics methods is illustrated by two examples. In one a possibility for the coexistence of clusters composed of different numbers of quarks is analysed, phase transitions in the model of coexisting multiquark clusters under changes of temperature and nuclear-matter density are studied. It is shown that such temperature and density intervals exist, when it is thermodynamically profitable for a system to pass on a state that is a mixture of nucleons, six-, nine- and even twelve- quark components. In the other example the principle of correlation weakening in the space of relative four-dimensional velocities is established, being analogous to the Bogolubov principle of correlation weakening formulated for the usual space. The validity of the relativistic principle of correlation weakening is based on experimental data on multiparticle production under collisions of nuclei. 32 refs.; 4 figs.

17295 (JINR-R—4-85-876) Closer of the chain of kinetic equation moments and description of the negative-parity collective excitations. Bal'butsev, E.B.; Vajshvila, Z.; Mikhajlov, I.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700803.

It is shown that for a consistent description of the evolution of Jsub(isub(1)isub(2)...isub(n))= ∫rhoxsub(isub(1)xsub(isub(2))...xsub(isub(n))dr vector tensor by means of the kinetic

equation it is necessary to take into account the Fermi surface deformation (FSD) with multipolarity up to rank n. Inclusion of the octupole FSD considerably influence the estimation of the energy of the giant octupole resonance and allows one to describe the low-lying octupole excitations. 11 refs.

17296 **(JINR-R—4-86-115) Basic equations of the quasiparticle-phonon nuclear model for deformed even-even nuclei.** Nesterenko, V.O.; Solov'ev, V.G.; Sushkov, A.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1986. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700804.

The equations of the quasiparticle-phonon nuclear model for the description of nonrotational states in deformed even-even nuclei are given in the general form. The Pauli principle is taken into account in the two-phonon components of the states. 9 refs.

17297 **(KIYI—85-25) Deuteron break up in Coulomb field of nuclei.** Verbitskij, V.P.; Terenetskij, O.K. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1985. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700834.

An influence of electric deuteron breakup on its elastic scattering has been considered in adiabatic approximation. The formulas free of the varied parameters for differential cross-sections of scattering and total cross-sections of deuteron breakup have been obtained in semiclassical approximation. Z- and E-behaviour of total cross-sections of deuteron electric breakup has been investigated. 58 refs.; 11 figs.; 1 tab.

17298 **(LA-UR—86-4264) [International conference and symposium on unified concepts of many-body problems]: Symposium summary.** Garvey, G.T. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 10p. (CONF-8609163—8). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003743.

From International conference and symposia on unified concepts of many-body problems; Stony Brook, NY, USA (4 Sep 1986).

A review is given of the topics presented at the symposium. 12 refs., 5 figs. (DWL)

17299 **(TRI-PP—86-100) SIGMA hypernuclei: A theoretical review.** Gal, A. (TRIUMF, Vancouver, British Columbia (Canada)). Oct 1986. 9p. (CONF-8608135—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87900322.

From INS international symposium on hypernuclear physics; Tokyo, Japan (20 Aug 1986).

The Σ-hypernuclear data are briefly reviewed and production of continuum states is discussed. Difficulties in relating the structures observed in stopped K^- reactions, and in flight, to Σ-nuclear interaction parameters are mentioned. In particular, the interplay between spin (including spin orbit) and isospin dependence of the ΣN effective interaction is demonstrated by a recent extensive shell-model study of the $^{12}C(K^-,\pi)$ reactions. 22 refs., 9 figs., 2 tabs.

17300 **Probing for Dirac vacuum structure in nuclei.** Auerbach, N.; Goldhaber, A.S.; Johnson, M.B.; Picklesimer, A.; Miller, L.D. (Los Alamos National Lab., NM, USA; Virginia Univ., Charlottesville, USA. Inst. for Nuclear and Particle Physics). *Physics Letters [Section] B;* **182**: No. 3/4, 221-225(25 Dec 1986).

Recent Dirac-equation analyses of nucleon-nucleus interactions indicate weak dependence of the effective potentials on nucleon energy, and suggest that associated with any large nucleus is an 'island' of ≃ 10/sup 3/ discrete negative-energy nucleon bound states. Experimental searches for this structure would be a critical test of the Dirac-equation picture. Possible experiments as well as open theoretical issues are discussed.

17301 **Dispersive effects in low energy pion-nucleus scattering.** Ernst, D.J.; Giebink, D.R.; Johnson, M.B. (Texas A and M Univ., College Station, USA. Dept. of Physics; Los Alamos National Lab., NM, USA). *Physics Letters [Section] B;* **182**: No. 3/4, 242-246(25 Dec 1986).

Dispersive effects on intermediate nucleons and deltas in the pion-nucleon scattering amplitude are shown to be very important for low energy (T/sub π/≦80 MeV) pion-nucleus reactions. The inclusion of this interaction in comparison with familiar three-body approaches is shown to alter the predicted differential cross sections of a first-order optical potential by more than an order of magnitude and total cross sections by more than a factor of four. In the presence of a second-order potential which incorporates the effect of pion true absorption, differential cross sections differ by a factor of more than three and total cross sections by a factor of two. The large effect is caused by the rapid energy dependence of the imaginary part of the two-body amplitude near the elastic threshold.

17302 **Supersymmetry in nuclear physics.** Iachello, F. (A.W. Wright Nuclear Structure Lab., Yale Univ., New Haven, CT). pp 607-622 of Supersymmetry. Dietz, K.; Flume, R.; Gehlen, C.; Rittenberg, V. New York, NY; Plenum Press (1985). (CONF-8408127—).

From NATO advanced study institute on supersymmetry; Bonn, F.R. Germany (20 Aug 1984).

About 10 years ago a new concept (supersymmetry) was introduced in physics. Originally developed for applications in elementary particle physics, this concept has been recently applied to a variety of problems, both in relativistic and non-relativistic physics. Up to now, the only field in which experimental examples of supersymmetries have been found is nuclear physics. Supersymmetry here has been used to classify simultaneously spectra of even-even and odd-even nuclei. In this paper the author briefly reviews applications of supersymmetry considerations to problems in nuclear physics.

17303 **First forbidden beta decay in light nuclei.** Millener, D.J.; Warburton, E.K. (Brookhaven National Lab., Upton, NY 11973). pp 365-376 of International symposium on nuclear shell models. Vallieres, M.; Wildenthal, B.H. Philadelphia, PA; World Scientific Pub. Co. (1984). (CONF-8410144—).

From International symposium on nuclear shell model; Philadelphia, PA, USA (31 Oct 1984).

Beta decay matrix elements for the operators σ . del and σ . r are calculated for eight J/sup +/ 1/n J/sup -/ beta transitions. Results using harmonic oscillator wave functions differ markedly from those using more realistic Woods-Saxon wave functions. A substantial contribution to the σ . del matrix elements from pion exchange currents is required to reproduce the experimental beta decay rates.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 16114, 16603, 17356, 17356

17304 **(BARC—1259) SHARDA - a program for sample heat, activity, reactivity and dose analysis.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 41p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87701252.

A computer program SHARDA (Sample Heat, Activity, Reactivity and Dose Analysis) has been developed for safety evaluation of Pile Irradiation Request (PIR) for various nonfissile materials in the research reactor CIRUS. The code can also be used, with minor modifications, for PIR safety evaluations for the research reactor DHRUVA, now being commisioned. Most of the data needed for such analysis like isotopic abundances, their various nuclear cross-sections, gamma radiation and shielding data have been built in the code for all nonfissile naturally occuring elements. The PIR safety evaluations can be readily carried out using this code for any sample in elemental, compound or mixture form irradiated in any location of the reactor. This report describes the calculational model and the input/output details of the code. Some earlier irradiations carried out in CIRUS have been analysed using

this code and the results have been compared with available operational measurements. 7 refs., 4 tables.

17305 **(BARC—1293) Calculation of damage cross section.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701258.

In radiation embrittlement studies the density of the atomic displacement is an appropriate measure of the damage produced in the material rather than the integrated neutron number fluence. The measured neutron number fluence can be converted to atomic displacement using damage cross sections. A computer programe DAMCROSS was therefore developed for the calculation of damage cross-section. This report gives the damage cross-section for iron and carbon for elastic scattering, inelastic scattering and radiative capture of neutrons.

17306 **(EFI—780(7)-85) Nuclear-optical methods for production of polarized photons with energies of a few hundred GeV.** Ispiryan, K.A.; Ispiryan, M.K. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700675.

The absorption coefficients of linearly polarized photons passing through a crystal in parallel to its crystallographic planes are calculated. The methods of determination of the obtainable degree of polarization as well as of the intensity losses for the cases when non-polarized photon beams pass through various crystals in parallel to the planes (110) are described. The energy dependence of the thickness of the quarter-wave plate crystals transforming the linear polarization of the beam into circular one is obtained. 21 refs.; 5 figs.; 1 tab.

17307 **(FEI—1548) Temperature dependence of the generalized frequency water spectrum.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 25p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701282.

From experimental data on inelastic scattering of slow neutrons by water the generalized frequency spectrum (GFS) of hydrogen atom of water molecule in the 300-600 K temperature range is obtained. The iteration method has been used which is based on adequate comparison of experimental and calculated double-differential cross sections of slow neutrons scattering by water taking into account multiple neutron scattering effects in a sample and spectrometer resolution. A qualitative discussion of GFS temperature dependence using other experimental and calculation data is outlined. 35 refs.; 9 figs.; 1 tab.

17308 **(FEI—1551) Collective excitation of a target by high-density electron beam.** Yudin, G.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700693.

Collective inelastic forced bremsstrahlung in high-density (dsub(c)) electron beam collisions with arbitrary quantum target is considered. For each N/sub 1/ approximately n/sub 0/ (V/Ω)/sup 3/ neiboughring beam electrons excitation amplitudes are superimposed in a coherent manner. For each N/sub 12/ approximately/ sub 0/ (c/νsub(0)ω)sup(3) neiboughring electrons processes of external field quantum absorption and emission coinside (n/sub 0/) is mean electron beam density, V-electron cluster velocity, Ω-excitation frequency, ν/sub 0/-effective number of emitted (absorbed) quanta, ω-electromagnetic wave frequency. Relation of excitation cross-sections of photoabsorbed target at collective effect to total sections for separate beam electrons is g=1+Nc, where effective number of collective scattering electrons. Nc = min (N/sub 1/, N/sub 2/, Nsub(e). In concrete channels of atom excitation collective effects are more convenient for observation for transtions between high-excited states, and also fine or hyperfine structure componets. General relations for effective ion cluster slowing-down in arbitrary medium, generalizing the known Bethe formula, are obtained. Analysis of interferential terms in analogous task at superlight beam motion in a medium shows that collective effects are present in Cherenkov radiation as well, where Nsub(c)=min (N/sub 1/, Nsub(e)). At this multiplier is included in spectral Tamm-Frank distribution. Behaviour of scattering cross-sections of hard electromagnetic radiation on heavy atom and dense plasma electrons is the same. 11 refs.

17309 **(FEI—1554) Investigation of time evolution of leakage neutron spectra from the surface of a molybdenum sphere in the nanosecond range.** Bezhunov, G.M.; Matusevich, E.S.; Dubinin, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 30p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700694.

The technique of experimental investigation of time evolution of neutron spectra in medium in the nanosecond region during a short neutron pulse, using a californium chamber as a statistic pulse neutron source and a multichannel analyzer in the regime of multiple analysis, is considered. The results of investigation of nonstationary neutron spectra of leakage from the surface of the molybdenum sphere in the neutron energy range from 10.5 to 0.4 MeV and within the time interval from 0 to 130 ns are given. Experimental results are given in comparison with the calculation by the kinetic ROZ-V-1 program using group neutron BNAB constants. Considerable difference between calculated and experimental results is observed in the neutron energy range from 2.5 to 0.4 MeV. The difference observed is supposed to be connected with doubtfullness of neutron inelastic scattering constants for molybdenum in the used library. 14 refs.; 5 figs.; 1 tab.

17310 **(FEI—1630) On the method of separation of regions in the framework of the neutron transport theory.** Abramov, B.D.; Shikhov, S.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1984. 28p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700695.

The series of algorithms for the method of region separation is suggested and investigated to solve the neutron transport equation in geometrically complex regions. Convergence conditions are explained, convergence rate evaluations are given, and algorithms with the increased convergence rate are detected. These algorithms can be also used as algorithms for convergence acceleration of the iterative process by collisions. 14 refs.

17311 **(IAE—4110/2) Difference equation of neutron thermalization in vibrational-nonequilibrium medium.** Soldatov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1985. 25p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700704.

Neutron thermalization in heavy molecular gas at arbitrary population of vibrational levels of energy is considered. Differential type equation describing stationary spectrum of thermal neutrons in such media is obtained. The solution method is developed and the calculation results are compared with solution of a corresponding integral transport equation. 14 refs.

17312 **(INDC(AUS)—011/LI) Calculation of the energy spread and the average neutron energy of 14 MeV neutrons produced via the T(d,n)/sup 4/He reaction in solid Ti-T targets.** (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). Jul 1986. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701290.

A Monte Carlo code was developed in order to calculate the energy distribution profile of 14 MeV neutrons produced via the T(d,n)/sup 4/He reaction with solid titanium-tritium targets. The slowing down and the angular straggling of the deuterons in the target as well as the finite size of the irradiated sample and the neutron source are taken into account. 17 refs, 10 figs, 2 tabs.

17313 (INIS-SU—370, pp 35-39) **Asymptotic solution of transport equation with an arbitrary indicatrix.** Serezhnikov, S.V. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Asymptotic solution of the transport equation with arbitrary scattering indicatrix is obtained in the framework of approximations of forward-ahead and constant total cross section.

17314 (PNL—5500-Pt.4, pp 15-16) **Double differential ionization cross sections.** Toburen, L.H.; DuBois, R.D.; Manson, S.T. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The importance of charged particle track structure on the subsequent chemical and biological processes initiated by ionizing radiation is well recognized. An accurate representation of the detailed track structure relies on an accurate knowledge of the production and transport of secondary electrons. A major task of this program is to understand the mechanisms responsible for secondary electron production such that theoretical techniques can be used to reliably extrapolate cross sections to regions where data are unavailable. These studies involve measurements over as wide a range of experimental parameters as possible to obtain cross section systematics; these data can then be compared to theoretical calculations to better understand the interaction process. The authors have now compiled relatively extensive experimental cross sections for ionization of neon by protons.

17315 (PNL—5500-Pt.4, pp 16-17) **Theoretical single differential cross sections for bare ions.** Miller, J.H.; Wilson, W.E. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Semiempirical models that extend the data base of differential ionization cross sections have proved quite useful in applying these data to radiological atmospheric and plasma physics. In recent years, the authors have been particularly successful in developing models that are based on Bethe's theory of energy loss by fast charged particles. The theory requires evaluation of coefficients in Bethe's asymptotic expansion of the first born approximation to the inelastic scattering cross section of high velocity ions. These coefficients can be calculated from quantum mechanics; however this approach is laborious and of questionable accuracy for molecular targets. Recognizing that the desired coefficients are independent of projectile properties, they developed a semiempirical method to evaluate them that is based on measured optical oscillator strengths and proton impact ionization data at a single ion energy. They can then use the coefficients to predict the energy spectrum of secondary electrons ejected by any bare ion at any energy that is sufficiently large to make the Bethe theory valid.

17316 (PNL—5500-Pt.4, pp 18) **Structured ion impact: double differential cross sections.** DuBois, R.D. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

For structured ion impact, the projectile arrives at the collision region with its own electron(s). Hence the electrons observed emanating from the collision region can arise from 1) target ionization or 2) projectile ionization. Since the electrons arising from projectile ionization predominantly have very low energies in the projectile frame, they are strongly peaked in angle and energy in the laboratory frame. Hence, in some cases, it is possible to graphically separate them from the smooth underlying continuum of electrons due to target ionization. To provide some information in this subject, the authors have initiated a new series of experiments in which the emitted electrons are observed in coincidence with another collision product. Using He^+ - Ar collisions as an initial test, they measured coincidences between emitted electrons and the direct beam (e^-, He^+) as well as between electrons and the stripped beam (e^-, He^{++}). These should correspond to target ionization and projectile ionization, respectively.

17317 (PNL—5500-Pt.4, pp 18-19) **Theoretical cross sections for ionization structured ions.** Miller, J.H.; Toburen, L.H.; Manson, S.T. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Most of the energy deposited in tissue by ionizing radiation is delivered by structureless, charged particles (bare ions). At low velocity, positive ions may capture electrons from medium to form structured ions. The cross sections for ionization by structured ions are usually derived from bare ion data through the use of an effective charge. This approximation cannot explain the difference between the energy spectra of secondary electrons ejected by bare ions and that of structured ions. The Born approximation provides a conceptual framework for understanding the features of differential cross sections for ionization by structured ion, but ab initio calculations are only practical. The authors have discovered that the characteristics of Bethe's theory for bare ions that make it amenable to semiempirical calculations can be carried over to structured ions. By including the form-factor of the orbital electron on the projectile in the integration over momentum transfer, the single differential cross section for target ionization can be expressed.

17318 (PNL—5500-Pt.4, pp 19-20) **Total ion and electron yields.** DuBois, R.D.; Rudd, M.E. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

In 1981, in collaboration with Prof. M.E. Rudd (University of Nebraska), the authors began an experimental investigation of total ion and electron production cross sections. The study emphasized absolute cross sections over a broad energy range for many atomic and molecular targets. Such cross sections are essential in evaluating their existing double differential cross sections and provide accurate normalizations for track structure calculations. Initially the work concentrated on proton impact ionization. Cross sections from 5-4000 keV were measured and fitted to empirical equations. This greatly facilitates their incorporation into track structure computer codes. These data for ten atomic and molecular targets were published in Physical Review A in January 1984. The H_2O data were missing from this initial study. These data have since been evaluated in the same manner. In addition, this year they have turned their attention to He^+ impact.

17319 (PNL—5500-Pt.4, pp 20-21) **Multiple target ionization by proton impact.** DuBois, R.D.; Toburen, L.H.; Manson, S.T. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The experimental total and double differential cross section measurements provide no information about the final target ion charge state. It is generally assumed that single ionization dominates and that any multiple ionization occurs via the Auger channel. However, in measurements of multiple ionization due to proton impact, the authors found that approximately 60% of the electron production for high energy H^+ - Kr collisions was the result of multiple ionization. Thus it is essential to incorporate multiple ionization into the theoretical picture of the collision; but to do so, one must determine what multiple ionization mechanisms are important. Hence, last year the authors determined cross sections for all relevant channels leading to double ionization of Ne by high energy proton impact.

17320 (PNL—5500-Pt.4, pp 23-25) **Measurement of energy deposition near heavy ion tracks.** Metting, N.F.; Brady, L.A.; Rossi, H.H.; Kliauga, P.J.; Howard, J.; Wong, M.; Schimmerling, W.; Rapkin, M. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

In November of 1982 work was begun in collaboration with Columbia University and Lawrence Berkeley Laboratory to use microdosimetric methods to measure energy deposition of heavy ions produced at LBL's Bevalac Biomedical Facility. Last year the authors reported preliminary results indicating that secondary

charged particle equilibrium was probably obtained using this experimental setup, but that there seemed to be poor spatial resolution in the solid state position-sensitive detector. Further analysis of the measurements taken in August 1983 shows that because of this electronic noise in the position-sensitive detector, only the ^{56}Fe data yielded useful microdosimetric spectra.

17321 (PNL—5500-Pt.4, pp 25-26) **Effects of phase on differential ionization cross sections.** Miller, J.H.; Wilson, W.E.; Brenner, D.J. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The data base for understanding interactions of radiation with matter is obtained primarily from experiments in the gas phase; however, in radiological physics the authors are mostly concerned with energy deposition in a condensed medium. Hence, it is important to understand how intermolecular forces in condensed matter effect energy transfer and degradation. Phase effects can be divided into two categories. 1) effects of phase on the transfer of energy from radiation to matter and 2) the phase dependence of energy degradation and formation of chemical species. The former, which is much better understood at present, is discussed in this section.

17322 (PNL—5500-Pt.4, pp 26-27) **Ion yields in liquid water.** Miller, J.H.; Brenner, D.J.; Ritchie, R.H. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

Progress in modeling the phase dependence of differential ionization cross sections has provided some of the basic information needed to calculate ion yields in liquid water. However, since little is known about the physical mechanisms that determine the yield of chemical species in condensed matter, many assumptions must be made before one can connect the basic cross section data with picosecond yield measurements. This paper summarizes their current model. Most ions are formed in glancing collisions with small momentum and energy transfer to the medium. In liquid water the final state of such collisions is expected to be a low energy, quasi-free electron and a residual ion with a vacancy in one of the valence orbitals. Multiple ionization is neglected in the current model.

17323 (PNL—5500-Pt.4, pp 29-30) **Application of microdosimetry techniques in health physics.** Braby, L.A.; Metting, N.F. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

In recent years tissue equivalent proportional counters (TEPC) an microdosimetric concepts have provided valuable insights into the nature of the interaction of various radiations with biological material. It is now becoming evident that these same techniques can be extended to improve measurements of mixed radiation fields for the purpose of radiation protection. A prototype instrument that the authors developed for NASA under a related services agreement has shown that it is possible to automate all of the necessary functions and to provide the required sensitivity in a compact portable instrument. Subsequent analysis of data collected with this instrument has shown that it produces dose equivalent and mean quality factor values in good agreement with calculated values for monoenergetic neutrons.

17324 (PNL—5500-Pt.4, pp 53-54) **Monte Carlo calculation of energy deposition and ionization yield for high energy protons.** Wilson, W.E.; McDonald, J.C.; Coyne, J.J.; Paretzke, H.G. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

The stochastic distributions of ionization and energy deposition in small volumes (volumes less than a few tenths of a micron in diameter) by charged particles are of importance to the dosimetry of internal alpha emitters. The calculation of these distributions and parameterization of their systematics is a major activity since the results will be useful in other dosimetry areas as well. One such application is introducing straggling into event-size spectra for neutrons. Recent calculations of event-size spectra for neutrons use of continuous slowing down approximation model for the energy losses experienced by secondary charged particles (protons and alphas) and thus do not allow for any straggling effects. Discrepancies between the calculations and experimental measurements are thought to be, in part, due to the neglect of straggling. A tractable method for including stochastics in the radiation transport calculations is the Monte Carlo method; a number of efforts toward simulating positive ion track structure have been initiated. Major emphasis has been on calculating energy deposition and ionization yield spectra for recoil proton crossers since they are the most prevalent event type at high energies for small volumes. Neutron event-size spectra can then be obtained from them by numerical summing folding techniques.

17325 (SLAC-PUB—4203) **Properties of the EM cascade: A tutorial utilizing high resolution 3D color graphics.** Nelson, W.R. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Feb 1987. 22p. (CONF-870219—8). NTIS, PC A02. File Number DE87005596.

From Midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

The fundamental interactions of electrons and photons are reviewed that are important to shower physics. The shower is then described, including a simple model, an advanced analytic model, and Monte Carlo approaches. Examples of real, as well as simulated, EM showers are discussed, and some "rules of thumb" are provided. (LEW)

17326 (UCRL—95946) **Modeling the behavior of optical elements in radiation environments.** Barlow, T.A.; Rhoades, C.E. Jr.; Merker, M.; Triplett, J.R. (Lawrence Livermore National Lab., CA (USA); S-Cubed, La Jolla, CA (USA)). 3 Nov 1986. Contract W-7405-ENG-48. 9p. (CONF-8611116—3). NTIS, PC A02. File Number DE87005053.

From Nuclear explosives code developers conference; Albuquerque, NM, USA (16 Nov 1986).

Calculation of heating caused by the deposition of x-rays in thin film optical elements is complicated because the mean free path of photo and autoionization electrons is comparable to the thin film thickness and thus the electron deposition cannot be considered local. This paper describes the modeling in a 1-D code of: (a) x-ray deposition and transport; (b) electron production, deposition and transport; and (c) thermal conduction and transport. X-ray transport is handled by multigroup discrete ordinates, electron transport is done by the method of characteristics, applied to the two term spherical harmonics expansion approximation (P1) to the Spencer-Lewis transport equation, and thermal transport is computed by a simple Richardson extrapolation of a backward Euler solution to the heat conduction equations. Results of a few test cases are presented. 8 refs., 26 figs., 2 tabs.

17327 **Evaluation and testing of double differential Fe(n,n') cross sections.** Fu, C.Y.; Hetrick, D.M. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society;* 53: 409-410(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

Analyses of integral experiments that include thick (>15-cm) iron regions have shown a consistent underprediction of neutron transmission. One explanation that has been offered is that the angular distributions of the inelastically scattered neutrons in the continuum in the current ENDF/B-V iron evaluation were assumed to be isotropic. In reality, these distributions are forward peaked, especially if the incident neutron energies (E/sub n/) are a few MeV greater than the continuum Q-value. The forward peaking also increases with increasing outgoing neutron energies (E/sub n'), giving rise to correlated energy-angle distributions. To understand their effects on neutron penetration through iron, the authors generated such correlated distributions in a special update of the ENDF/B-V Mod-3 iron evaluation and reanalyzed an iron sphere problem. Results are presented.

17328 **Conversion of radionuclide transport codes to IBM-compatible microcomputers.** Pon, W.D.; Marschke, S.F. (Envirosphere Co.). *Transactions of the American Nuclear Society;* 53: 416-419(1986). (CONF-861102—).

From American Nuclear Society and Atomic Industrial Forum joint meeting; Washington, DC, USA (16 Nov 1986).

This paper presents an approach for modifying select US Nuclear Regulatory Commission (NRC) computer codes for use on an IBM microcomputer and/or compatibles. The three codes selected are GALE, GASPAR, and LADTAP. These codes are used by utilities, architect/engineering firms, and various governing bodies for estimating normal operational radiological releases and impacts. Originally written for large mainframe computers, they have been transferred to smaller minicomputer systems without any real conversion of the structure of the codes.

6550 Medical Physics

17329 **(BARC—1303) Calibration of high-dose radiation facilities (Handbook).** (Bhabha Atomic Research Centre, Bombay (India)). 1986. 107p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87701266.

In India at present several high intensity radiation sources are used. There are 135 teletheraphy machines and 65 high intensity cobalt-60 sources in the form of gamma chambers (2.5 Ci) and PANBIT (50 Ci). Several food irradiation facilities and a medical sterilization plant ISOMED are also in operation. The application of these high intensity sources involve a wide variation of dose from 10 Gy to 100 kGy. Accurate and reproducible radiation dosimetry is essential in the use of these sources. This handbook is especially compiled for calibration of high-dose radiation facilities. The first few chapters discuss such topics as interaction of radiation with matter, radiation chemistry, radiation processing, commonly used high intensity radiation sources and their special features, radiation units and dosimetry principles. In the chapters which follow, chemical dosimeters are discussed in detail. This discussion covers Fricke dosimeter, FBX dosimeter, ceric sulphate dosimeter, free radical dosimetry, coloured indicators for irrdiation verification. A final chapter is devoted to practical hints to be followed in calibration work.

17330 **(EGG-M—19086) SKYSHIN: A computer code for calculating radiation dose over a barrier.** Atwood, C.L.; Boland, J.R.; Dickman, P.T. (EG and G Idaho, Inc., Idaho Falls (USA); USDOE Nevada Operations Office, Las Vegas; REECo, Las Vegas, NV (USA)). Nov 1986. Contract AC07-76ID01570. 9p. (CONF-870219—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87002100.

From Midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines; Reno, NV, USA (8 Feb 1987).

SKYSHIN is a computer code for calculating the radioactive dose (mrem), when there is a barrier between the point source and the receptor. The two geometrical configurations considered are: the source and receptor separated by a rectangular wall, and the source at the bottom of a cylindrical hole in the ground. Each gamma ray traveling over the barrier is assumed to be scattered at a single point. The dose to a receptor from such paths is numerically integrated for the total dose, with symmetry used to reduce the triple integral to a double integral. The buildup factor used along a straight line through air is based on published data, and extrapolated in a stable way to low energy levels. This buildup factor was validated by comparing calculated and experimental line-of-sight doses. The entire code shows good agreement to limited field data. The code runs on a CDC or on a Vax computer, and could be modified easily for others.

17331 **(PB—87-109872/XAB) Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards.** Pruitt, J.S. (National Bureau of Standards, Washington, DC (USA)). 27 Aug 1986. 6p. NTIS, PC A05/MF A01).

The method used at the National Bureau of Standards for the calibration of strontium-90 + yttrium-90 beta-particle ophthalmic applicators in terms of absorbed dose to water, is described. The method involves measurement of ionization density at the applicator surface with an extrapolation chamber, correction for the difference in backscatter between the collection electrode and water, and application of the Bragg-Gray equation. The calibration obtained is an average over the active surface of the applicator. The overall uncertainty of the surface calibration is about + or - 15 percent.

17332 **(PNL—5500-Pt.4, pp 52-53) Averaging dose in inhomogeneously irradiated tissue.** Roesch, W.C. Feb 1985. NTIS, PC A05/MF A01. File Number DE85009285.

In Pacific Northwest Laboratory annual report for 1984 to the DOE Office of Energy Research. Part 4. Physical sciences.

In doing dosimetry for radiation protection, time and cost usually lead the authors to settle for just one, or a few measurements of the dose a person might receive. These single doses sometimes have to represent situations in which the dose throughout an individual or an individual organ may be quite inhomogeneous, i.e., the dose may have a wide range of values. In many cell-culture experiments, if the dose is not too high, the effect is found to be a linear-quadratic function of the dose. In these experiments, the dose is uniform throughout the culture. If similar expressions are assumed to hold for cells receiving the same dose in vivo, then the average effect in a tissue where the dose is inhomogeneous can be found only when the corresponding averaged for both the dose and the square of the dose are known. Then the observed effects can be related to that found in vitro or to compare effects in different tissues.

17333 **Two example applications of optimization techniques to radiation protection programmes of United States Department of Energy Contractors.** Merwin, S.E.; Martin, J.B.; Selby, J.M.; Vallario, E.J. (Battelle Pacific Northwest Labs., Richland, WA, USA; Department of Energy, Washington, DC, USA. Office of Nuclear Safety). pp 193-203 of Optimization of radiation protection. Proceedings of an international symposium held in Vienna, 10-14 March 1986. Vienna, Austria; IAEA (1986). (CONF-860315—).

From International symposium on the optimization of radiation protection; Vienna, Austria (10 Mar 1986).

Six numerical examples of optimization of radiation protection are provided in the appendices of International Commission on Radiological Protection (ICRP) Publication 37. In each case, the calculations are based on fairly well defined parameters and assumptions that were well understood. In the paper, the authors examine two numerical examples that are based on empirical data and less certain assumptions. These examples may represent typical applications of optimization principles to the evaluation of specific elements of a radiation protection programme. In the first example, the optimum bioassay frequency for tritium workers was found to be once every 95 days, which compared well with the recommendations of ICRP Publication 10. However, this result depended heavily on the assumption that the value of a potential undetected rem was US$1000. The second example showed that the optimum frequency for recalibrating Cutie-Pie-type (CP) ionization chamber survey instruments was once every 102 days, which compared well with the Hanford standard frequency of once every 90 days. This result depended largely on the assumption that an improperly operating CP instrument could lead to a serious overexposure. These examples have led us to conclude that optimization of radiation protection programmes must be a very dynamic process. Examples must be recalculated as empirical data grow and improve and as the uncertainties surrounding assumptions are reduced. 5 refs, 3 figs.

17334 **Task group on Reference Man to revise ICRP Publication 23.** Richmond, C.R. (Oak Ridge National Lab., TN). *Health Physics;* 49: No. 5, 1015(Nov 1985).

In 1975 the International Commission on Radiological Protection (ICRP) published ICRP Publication 23, the Report of the Task Group on Reference Man. ICRP Publication 23 is about 15 y out of date, because the references cited end around 1970. At its 1984 meeting, the ICRP approved the formation of a new task group to revise and update this publication, with completion expected in about 3 y. The revision will include more emphasis on variations due to age, sex, and other individual differences in anatomical and physiological data and in the gross and elemental composition of tissues. The emphasis in Publication 23 is on data for

radiation workers, and the new emphasis reflects that radiation doses to the whole population are of increasing interest to the ICRP and national bodies interested in radiation protection.

17335 **Dose rate conversion factors.** Beck, H.L.; de Planque, G. (Dept. of Energy, New York, NY). *Health Physics;* 49: No. 5, 1015-1016(1985).

A letter to the editor comments on a recent Health Physics article in which dose-rate conversion factors were presented for external exposure to monoenergetic photon emitters in soil for various source depth distributions. The buildup factors are discussed.

6560 Condensed Matter Physics

REFER ALSO TO CITATION(S) 15924, 16329, 17072, 17076, 17085, 17190

17336 **(BARC—1294) Radiation enhanced self diffusion in silver.** (Bhabha Atomic Research Centre, Bombay (India)). 1985. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701259.

Radiation enhanced self diffusion in silver has been studied at room temperature as a function of defect production rate J(J varies between 0.90 dpa s/sup -1/ to 2.25 dpa s/sup -1/). The results show that the main mechanism of annihilation of point defects is by mutual recombination rather than migration to fixed sinks. 5 refs., 6 figures.

17337 **(BNL—39054) Spin-waves in the uniaxial spin-glass system Fe/sub 1-x/Mg/sub x/Cl$_2$.** Wong, P.Z.; Yoshizawa, H.; Shapiro, S.M. (Schlumberger-Doll Research Center, Ridgefield, CT (USA); Tokyo Univ. (Japan). Inst. for Solid State Physics; Brookhaven National Lab., Upton, NY (USA)). 12 Nov 1986. Contract AC02-76CH00016. 13p. (CONF-861111—20). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004246.

From Conference on magnetism and magnetic materials; Baltimore, MD, USA (17 Nov 1986).

We report as inelastic neutron scattering study of the uniaxial dilute antiferromagnets Fe/sub 1-x/Mg/sub x/Cl$_2$, for $x = 0.3$, 0.45 and 0.6. The first two samples have long-range AF order. Their spin-wave peaks are broadened by the exchange fluctuations. The $x = 0.6$ sample oders like an Ising spin-glass with a very short AF correlation length ($\xi \approx 10$ A). For wavelength $\lambda \leq \xi$, the spin-wave peaks are similar to the dilute antiferromagnets, but for $\lambda \leq 2\xi$, the peak shapens up and becomes resolution limited at the zone center. We give a simple explanation of this behavior. 13 refs., 1 fig.

17338 **(CONF-850484—) Photon emission from irradiated solids: Proceedings of the Werner Brandt workshop on penetration phenomena.** (Oak Ridge National Lab., TN (USA)). Nov 1986. Contract AC05-84OR21400. 181p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE87002878.

From Penetration phenomena workshop; Oak Ridge, TN, USA (14 Apr 1985).

The workshop was concerned with photon emission from irradiated solids and the present record of the proceedings consists of material solicited from each participant. The results range from detailed and complete manuscripts to skeletal remnants of Vugraph transparencies. Individual papers have been cataloged separately.

17339 **(CONF-861111—21) Induced magnetic form factor of CeCu$_6$.** Vrtis, M.L.; Loong, C.K.; Hinks, D.G.; Stassis, C.; Arthur, J.R. (Argonne National Lab., IL (USA); Ames Lab., IA (USA); Oak Ridge National Lab., TN (USA)). 1986. Contract W-31109-ENG-38. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004698.

From Conference on magnetism and magnetic materials; Baltimore, MD, USA (17 Nov 1986).

Polarized neutron scattering techniques have been used to study the spatial distribution and temperature dependence of the magnetization induced by an externally applied magnetic field in a single crystal of CeCu$_6$, a heavy-fermion compound that remains paramagnetic and non-superconducting down to ~10 mK. The measurements were performed at 4.2 K and 92 mK in an applied magnetic field of 50 kOe. We find that the induced magnetization is predominately of 4f electronic character and exhibits Pauli-like behavior in the 4.2 K to 92 mK temperature region. 17 refs., 2 figs.

17340 **(CONF-870144—1) The effects of heavy doping on the electronic states in semiconductors.** Sernelius, B.E. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA). Dept. of Physics). Jan 1987. Contract AC05-84OR21400. 90p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE87004421.

From International solid state physics workshop; Santiago, Chile (1 Jan 1987).

The physics of semiconductors is reviewed. Topics included in the discussion are energy of the dopant system (kinetic energy in a many-valley semiconductor, exchange energy in an ellipsoidal Fermi volume, energy in a polar semiconductor), self energy shifts, band-gap narrowing, and piezo experiments. 31 refs., 27 figs.

17341 **(CONF-8508107—3) Chemical potential in a stressed solid.** Li, J.C.M. (Rochester Univ., NY (USA). Dept. of Mechanical Engineering). 1985. Contract FG02-85ER45201. 7p. NTIS, PC A02/MF A01. File Number DE87003666.

From International seminar on solute defect interaction: theory and experiment; Kingston, Ontario, Canada (5 Aug 1985).

The chemical potential in a stressed solid is discussed in general. A chemical potential is defined whose gradient can be used as the driving force for diffusion. This potential is the same as that defined by Gibbs for fluids or solids under hydrostatic pressure and for his "fluid" or mobile components in a generally stressed solid. For crystalline solids, the chemical potential is the same as that of the interstitialcy. However, the definition avoids the need for atomistic details of the diffusion mechanism as long as the external work is well defined upon the addition or removal of the atom by the diffusion process. Hence it is applicable to diffusion along coherent or incoherent interfaces including grain boundaries, in an amorphous soild or in crystalline solids such as Si in which the diffusion mechanism is uncertain.

17342 **(DOE/ER/13007—1) Thin-film chemical sensors based on electron tunneling: Final report.** Khanna, S.K.; Lambe, J.; LeDuc, H.G.; Thakoor, A.P. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Nov 1985. Contract AI01-82ER13007. 37p. (JPL-PUB—85-85). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87004646.

The physical mechanisms underlying a novel chemical sensor based on electron tunneling in metal-insulator-metal (MIM) tunnel junctions were studied. Chemical sensors based on electron tunneling were shown to be sensitive to a variety of substances that include iodine, mercury, bismuth, ethylenedibromide, and ethylenedichloride. A sensitivity of 13 parts per billion of iodine dissolved in hexane was demonstrated. The physical mechanisms involved in the chemical sensitivity of these devices were determined to be the chemical alteration of the surface electronic structure of the top metal electrode in the MIM structure. In addition, electroreflectance spectroscopy (ERS) was studied as a complementary surface-sensitive technique. ERS was shown to be sensitive to both iodine and mercury. Electrolyte electroreflectance and solid-state MIM electroreflectance revealed qualitatively the same chemical response. A modified thin-film structure was also studied in which a chemically active layer was introduced at the top Metal-Insulator interface of the MIM devices. Cobalt phthalocyanine was used for the chemically active layer in this study. Devices modified in this way were shown to be sensitive to iodine and nitrogen dioxide. The chemical sensitivity of the modified structure was due to conductance changes in the active layer. 32 refs., 24 figs.

17343 **(DOE/ER/25009—371) Optimization by a computational neural net.** Williams, R.D. (California Inst. of Tech., Pasadena (USA)). 20 Nov 1986. Contract FG03-85ER25009;AC03-81ER40050. 21p. (CALT—68-1409). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005033.

A computational neural net is a fast analogue device that solves the mean-field equations for a spin glass, and can thus find a

local minimum of the spin-glass Hamiltonian. Many difficult combinatorial optimization problems can be cast in the form of spin glass minimization, and in this paper we contrast the quality of the minima achieved by a neutral net with those from simulated annealing. 12 refs., 3 figs.

17344 **(EFI—774(1)-85) Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons.** Atabekyan, R.R.; Gevorkyan, V.A.; Ezoyan, R.K.; Eritsyan, G.N.; Sarkisov, V.Kh. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700670.

Experimental results of the investigation of the kinemacs of storage, isochronous and isothermic annealing of coloraters induced in corundum by 50 MeV electrons are presented. The order of the reaction $\gamma=3$ and activation enegy epsilon = 1.1 eV are calculated basing on the data obtained. 13 refs.; 4 figs.

17345 (INIS-mf—10556-Vol.1, pp 90-100) **Electron and ion beams in surface investigation of solids.** Delong, A. (Ceskoslovenska Akademie Ved, Brno. Ustav Pristrovoje Techniky). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Attention is devoted to methods of the study of solid surfaces, especially to those which allow to image the studied surface by electron and ion microscopy. Experimental possibilities are summed up and indicated of the different methods. The paper deals with the configuration of electron and ion optical systems for surface studies; with imaging and analysis of surfaces using transmission electron microscopy and scanning transmission electron microscopy; with reflection and diffraction electron microscopy; with scanning electron microscopy; with emission electron microscopy; and with the use of ions for studies of solid surfaces. (S.P.).

17346 (INIS-mf—10556-Vol.2, pp 459-464) **Surface studies by sputtering.** Sigmund, P. (Odense Univ., Denmark). 1984. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700738. (CONF-8408138—Vol.2).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

The article presents an overview of the study of materials surfaces by sputtering, i.e., using the method of materials erosion under particle bombardment. The phenomenon is described in general terms, of sputtering by ion beams and possible practical applications are indicated. The techniques used in experimental investigations of the sputtering effect are dealt with and the mechanism of processes contributing to the effect is described. The emission of molecules and clusters in particle bombardment of surfaces is also discussed. Attention is then devoted to sputtering processes in multicomponent materials under the impact of ion bombardment of surfaces. (S.P.).

17347 **(INS—543) Monte Carlo study of anisotropic Heisenberg chain with spin 1.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Jun 1985. 22p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701313.

A Monte Carlo method of quantum spin 1 systems is presented. The internal energy and longitudinal correlation functions are computed in the antiferromagnetic region. Some exponents and phase diagram are derived in good accuracy.

17348 **(ITEF—81(1985)) Dynamic processes when irradiating of solids.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 51p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87701318.

General results of scientific-technical colaboration of the Institute of Theoretical and Experimental Physics and A.A. Baykov Metallurgy Institute of AS of USSR are given. The purpose of combined investigations is to develop ideas about dynamic processes when irradiating of solids, from a position of search of ways for the solution of applied problems of radiation material-science and radiation technology. The research program is given; the means of its security are enumerated; the most important information on dynamic processes, obtained by means of different experimental methods, is given too. The possible fields of practical using of this work results are shown; the prospects of subsequent investigations and the role of field ion microscopic analysis of defect structural of irradiated metallic specimens in these investigations are outlined. 58 refs.; 5 figs.; 3 tabs.

17349 **(ITEF—186(1984)) Symmetrized coordinate method in profile analysis for commensurable structure phase transformations.** Sikora, V.; Smirnov, P.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1984. 28p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700749.

Models of possible crystal structures of low-symmetric phase in cerium and lanthanum trihydrides are plotted. Topological peculiarity of fermi-surface of highly symmetric phase is used for determination of wave vector stars over which phse transition proceeds and possible crystal lattices of the low-symmetric phase. The theoretical-group analysis was used to identify hydrogen deuterium atom positions in new Brave HC-cells as shifts of BC-phase. The observed additional reflections on neutron powdergrams are shown to be conditioned by these shifts. 10 refs.; 3 tabs.

17350 **(LA-UR—86-3745) The spatial dependence of spin and charge correlations in a one-dimensional, single impurity, Anderson model.** Gubernatis, J.E. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 11p. (CONF-8611111—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002927.

From Taniguchi symposium on Quantum Monte Carlo; Shizuoka, Japan (13 Nov 1986).

Summarized are the results of a series of quantum Monte Carlo calculations of the spatial dependence of spin and charge correlations in a one-dimensional, single impurity, symmetric Anderson model. We corroborated several features of the model of Gubernatis, Hirsch, and Scalapino, and because we achieved lower temperatures, we were able to identify several additional unusual features in the behavior of the correlations as functions of U and β. We also showed the existence of a charge compensation sum role and found a power law decay of the correlations at low temperatures.

17351 **(LA-UR—86-4187) Nuclear interlevel transfer driven by collective outer shell electron oscillations.** Rinker, G.A.; Solem, J.G.; Biedenharn, L.C. (Los Alamos National Lab., NM (USA); Duke Univ., Durham, NC (USA)). 20 Oct 1986. Contract W-7405-ENG-36. 13p. (CONF-861038—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003734.

From OSA/APS international laser science conference ↑; 0.

The general problem of dynamic electron-nucleus coupling is discussed, and the possibility of using this mechanism to initiate gamma-ray lasing. Single-particle and collective mechanisms are considered. The problems associated with accurate calculation of these processes are discussed, and some numerical results are given. Work in process in described. 10 refs., 7 figs.

17352 **(LA-UR—86-4339) Analysis of picosecond pulsed laser melted graphite.** Steinbeck, J.; Braunstein, G.; Speck, J.; Dresselhaus, M.S.; Huang, C.Y.; Malvezzi, A.M.; Bloembergen, N. (Los Alamos National Lab., NM (USA); Massachusetts Inst. of Tech., Cambridge (USA); Harvard Univ., Cambridge, MA (USA)). 1986. Contract W-7405-ENG-36. 10p. (CONF-861207—45). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003755.

From Materials Research Society fall meeting; Boston, MA, USA (1 Dec 1986).

A Raman microprobe and high resolution TEM have been used to analyze the resolidified region of liquid carbon generated by picosecond pulse laser radiation. From the relative intensities of the zone center Raman-allowed mode for graphite at 1582 cm^{-1}

and the disorder-induced mode at 1360 cm^{-1}, the average graphite crystallite size in the resolidified region is determined as a function of position. By comparison with Rutherford backscattering spectra and Raman spectra from nonosecond pulsed laser melting experiments, the disorder depth for picosecond pulsed laser melted graphite is determined as a function of irradiating energy density. Comparisons of TEM micrographs for nanosecond and picosecond pulsed laser melting experiments show that the structure of the laser disordered regions in graphite are similar and exhibit similar behavior with increasing laser pulse fluence.

17353 **(ORNL/M—295) Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation.** Tsang, K.L.; Zhang, C.H.; Callcott, T.A.; Arakawa, E.T.; Ederer, D.L. (Tennessee Univ., Knoxville (USA). Dept. of Physics; Oak Ridge National Lab., TN (USA); National Bureau of Standards, Washington, DC (USA). Synchrotron Ultraviolet Radiation Facility). [1986]. Contract AC05-84OR21400. 2p. NTIS, PC A02. File Number DE87005231.

A core excited Li atom is perhaps the simplest cation defect that can be introduced into LiF. It frequently binds an electron in an electronic state, whose properties dominate both the soft x-ray absorption and soft x-ray emission properties of LiF. This phenomena was examined using a new, very high efficiency, emission spectrometer. Exciton and valence band peaks were observed which decay with time and are replaced by a metallic Li peak at 54 eV.

6561 Superconductivity

REFER ALSO TO CITATION(S) 16284

17354 **(CONF-860914—31) Nature of coupling and dimensional crossover in superconducting multilayers.** Locquet, J.P.; Sevenhans, W.; Bruynseraede, Y.; Homma, H.; Schuller, I.K. (Argonne National Lab., IL (USA); Louvain Univ. (Belgium). Lab. voor Vaste Stof-Fysika en Magnetisme). Sep 1986. Contract W-31109-ENG-38. 5p. NTIS, PC A02. File Number DE87004676.

From Applied superconductivity conference (ASC '86); Baltimore, MD, USA (28 Sep 1986).

A comparison of the temperature dependent upper critical fields in Josephson and proximity coupled multilayers is presented. The results are in good agreement with theoretical expectations which predict that the main determining factor is the spatial variation of the electronic density of states.

17355 **(IAE—4027/10) On the stability of superconducting systems under slightly chance thermal perturbations.** Levchenko, E.B.; Chechetkin, V.R. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1984. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700701.

Mean time of transient to the normal state is calculated for a superconductor with transport current and forced cooling under the action of weak random heat release. Perturbations are considered in the form of given external noise source and are simulated by the Gaussian white noise and shot white noise. In the limits of "dense" noise mean time of transient may be found from the solution of the functional Fokker-Plank equation (the Gaussian noise) or from the solution of the functional Kholmogorov-Feller equation (shot noise). Two limiting cases of spatialy homogeneous and spatially localized heat perturbations are under study. In the latter case a transient to the normal state is accomplished by means of fluctuation formation and the following propagation of the minimum propagating zone. 27 refs.; 2 figs.

6570 Theoretical And Mathematical Physics

REFER ALSO TO CITATION(S) 16345, 17681

17356 **(CEA-CONF—8514) Numerical solution of transport equations with particle correction.** Sentis, R. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). May 1986. 4p. (In French). (CONF-8605206—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750564.

From National congress on numerical analysis; Port Barcares, France (26 May 1986).

In particle transport phenomena, particle density verifies an equation basis of a whole series of physics modelling and which is used in numerous applications such as neutronics, astrophysics, lasers, plasmas, electron beams, etc. A resolution method of such equations is proposed here, based on moments method in which the flux is calculated thanks to an estimation made with a particle method.

17357 **(CONF-860789—3) What underlies the Anderson Hamiltonian.** Koelling, D.D. (Argonne National Lab., IL (USA)). Oct 1986. Contract W-31109-ENG-38. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004991.

From International workshop on condensed matter theories; Argonne, IL, USA (21 Jul 1986).

The Anderson Hamiltonian characterizes a model in which local orbitals interact with each other through Coulomb interactions and with a bath of itinerant states through hybridization. In trying to find a prescription for the parameters of the model, one simultaneously develops some understanding of the states involved and studies whether the model incorporates enough of the essential physics. One useful tactic is to compare this model with other models and ask how different effects are accommodated. This paper compares results from the model with atomic, band, and modified band calculations for f-electron materials. It did not appear to incorporate effects that seemed to be significant. Specifically, it is difficult to see the relation of this model to the multiple-screening-mode model which is a natural interpretation of our band calculations. The computations are represented as a surrogate for the experiment.

17358 **(CONF-861247—1) Excitations in small spherical particles.** Rojas, R.; Claro, F. (Oak Ridge National Lab., TN (USA); Universidad Tecnica Federico Santa Maria, Valparaiso (Chile); Universidad Catolica de Chile, Santiago). Oct 1986. Contract AC05-84OR21400. 9p. (In Spanish). NTIS, PC A02/MF A01; GPO Dep. File Number DE87001941.

From 5. simposio Chiceno de Fisica; Santiago, Chile (18 Dec 1986).

The multipolar polarizability of a small metallic sphere with an oxide coating is obtained within the semiclassical infinite barrier method. The optical absorption and the energy loss spectrum are calculated for Al/Al_2O_3 spheres. A Lindhard-Mermin dielectric function is assumed for the response of the metal. 14 refs., 2 figs.

17359 **(EFI—775(2)-85) Gravitation and vacuum field.** Tevikyan, R.V. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700671.

Equations are proposed that describe particles with the spins s=0, 0.5, 1 completely, i.e. 2s+2 limiting fields at E -> infinity too. It is proved that the ordinary Gilbert-Einstein action for the gravitation field should be complemented by an action for the Bose-vacuum field. This implies that a cosmological term proportional to the square strength of the bose-vacuum field shoul be introduced in gravitation equations. A table of possible interactions of elementary particles is proposed on the basis of Poincare groups. A third form of matter, the vacuum field, is introduced in the field theory. 14 refs.; 1 fig.

17360 **(IFVE-OTF—85-56) Scalar multiplets in N=2 supergravity.** Zinov'ev, Yu.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700725.

Submitted to the journal Phys. Lett. .

A simple explicit construction of three types of models for scalar multiplets interaction with N=2 supergravity is proposed. Their scalar sectors correspond to the non-linear σ-models Sp(2, 2n)/Sp(2) x Sp(2n) sectors SU(2,n)/SU(2) x SU(n) x U(1) and O(4,n)/O(4) x O(n). 3 refs.

17361 **(IFVE-OTF—85-70) Baryon string model. Part 3. Quantum theory of single-mode configurations of three-string.** Plyushchaj, M.S.; Pron'ko, G.P.; Razumov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700726.

Submitted to the journal Theor. Math. Phys. .

The model, obtained by freezing the infinite number of degrees of freedom of a relativistic three-string is considered. Two possible one-mode configurations of a baryonic string are quantized, and the relativistic invariance of the resulting quantum systems is proved. 12 refs.; 2 figs.

17362 **(IFVE-OTF—85-167) Gravitational collapse in relativistic theory of gravitation.** Vlasov, A.A.; Logunov, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1985. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700730.

Submitted to the journal Theor. Math. Phys. .

It is shown that in the relativistic theory of gravitation, unlike GTR, the process of the massive body compression by gravitational forces has been stopped at the finite density of matter for the final period of the proper time. This phenomenon of gravitational kernel may be understood when analysing the motion of a probe particle in the gravitational field of the sphericlly symmetric body in Minkowski space. 5 refs.; 4 figs.

17363 (INIS-mf—10556-Vol.1, pp 65-75) **Einstein's Prague ideas on gravitation: the history and the present.** Bicak, J. (Karlova Univ., Prague, Czechoslovakia. Fakulta Matematicko-Fyzikalni). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

It was in Prague in 1911 and 1912 when Einstein started systematically on the way to the general theory of relativity. His Prague papers on gravitation are analyzed with an emphasis on new ideas and concepts but also on false turns he temporarily took. Einstein learned much about gravitation during this period, in particular in formulating new principles and in understanding the features which relativistic theory of gravitation should possess. In several "intermezzos from the present" some results of present-day physics connected with Einstein's ideas from the time of 1911 and 1912 are noted. The atmosphere of Einstein's days in Prague was briefly described in the booklet "Physics and Prague" published on the occasion of the Sixth General Conference of the European Physical Society by the Union of Czechoslovak Mathematicians and Physicists.

17364 (INIS-SU—370, pp 13-17) **Algebraic construction of soliton solutions related to sl(2,R) algebra.** Leznov, A.N.; Man'ko, V.I.; Chumakov, S.M. 1984. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87780078.

In Experimental and theoretical physics. Collection.

Concrete examples of soliton solutions related to s tr (2,R) algebra are considered in the framework of the algebraic method of construction of soliton solutions of nonlinear equations.

17365 **(ITEF—76(1985)) On the types of unbounded orbits in Kerr metric.** Zakharov, A.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700743.

Sets of particle motion constants for r-motion different types are considered. The topology of these sets is defined. 10 refs.; 5 figs.

17366 **(ITEF—101(1985)) Kaehler-Einstein invariant metrics on compact homogeneous manifolds.** Alekseevskij, D.V.; Perelomov, A.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700744.

Kaehler-Einstein invariant metrics on compact homogeneous manifolds are described. An exact Gell-Mann-Low function in considered cases is given by one-loop approximation. 22 refs.

17367 **(ITEF—102(1985)) Kaehler-Einstein invariant metrics on compact homogeneous manifolds.** Alekseevskij, D.V.; Perelomov, A.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700745.

Kaehler-Einstein invariant metrics on compact homogeneous manifolds are described. An exact Gell-Mann-Low function in considered cases is given by one-loop approximation. 2 refs.

17368 **(ITEF—109(1985)) Radiation gasodynamics equations in the tetrad form for astrophysical applications.** (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 52p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87701319.

The paper deals with the presentation of radiation gasodynamics relativistic equations with account of general relativity theory in the form accepted and widely applied in special relativity theory. With this purpose a strict formal determination of non-inertial accompanying reference system without rotation is given on the base of tetrad formalism using the Fermi-Walker four-momentum transfer rules. In this system derived are equations of physical kinetics relativistic collapse, the Einstein equations, equations of relativistic radiation gasodynamics for perfect and dissipative gases, Taub equation for shock waves with account for radiation and electron-positron pairs. On the base of the use of Lorentz local transformations and Ricci rotation coefficients these equations are recorded in the laboratory reference system to demonstrate the possibility of a relatively simple account of general relativity theory effects in equations having a form accepted in special relativity theory. 49 refs.

17369 **(ITEF—120(1985)) On the particle capture cross section in the Schwarzschild metric.** Zakharov, A.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700746.

An expression for the capture cross section of particle moving with arbitrary velocity at infinity is obtained. Cases of slow and ultrarelativistic motions of particles are considered. A comparison with Mielnik-Plebansky results is carried out. 8 refs.

17370 **(ITF—85-134-R) Reduction of integral equations for four identical particles in the case of finite range forces.** Levashev, V.P.; Navrotskij, M.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1985. 43p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700757.

An approach to investigating the four-particle systems is suggested. It is based on integral formulation of the equations of motion in a coordinate representation and uses effectively the short-

range character of nuclear forces. The system of two-dimensional integral equations whose kernels are determined by simpler subsidiary three-dimensional equations is obtained for the four identical spinless particles. 8 refs.; 3 figs.

17371 **(ITP—86-20-E) Study of the P-matrix structure using a potential description of two-particle interaction.** Babenko, V.A.; Petrov, N.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700763.

General relations are obtained for the P-matrix using a potential description. In different approximations for the P-matrix these relations lead to a correct asymptotic behaviour of the scattering phase at high energies. 15 refs.

17372 **(ITP—86-25-E) Generating matrix elements of the Hamiltonian of the algebraic version of resonating group method on intrinsic wave functions with various oscillator lengths.** Badalov, S.A.; Filippov, G.F. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1986. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700764.

The receipts to calculate the generating matrix elements of the algebraic version of resonating group method (RGM) are given for two- and three-cluster nucleon systems, the center of mass motion being separeted exactly. For the Hamiltonian with Gaussian nucleon-nucleon potential dependence the generating matrix elements of the RGM algebraic version can be written down explictly if matrix elements of the corresponding system on wave functions of the Brink cluster model are known. 8 refs.

17373 **(JINR—E-2-85-930) Higher hypercomplex numbers and quantum mechanics.** Polubarinov, I.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 28p. (CONF-8505333—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700782.

From 3. seminar group theoretical methods in physics; Jurmala, USSR (22 May 1985).

Algebras of hypercomplex numbers following octonion algebra are considered. These algebras are connected with finite projective geometries. Their main properties are derived from properties of structure constants sub(epsilon)jkl). A derivation of the identity is given that generalizes the law of composition of quadratic forms. Quantum mechanics corresponding to these algebras are formulated, equations of motion are written. Matrix representations are constructed (in the sense of the Dirac representation theory). In these terms the equations of motion take the standard quantum-mechanical Hamiltonian form. Except for the octonian algebra, others are in fact reducible. 56 refs.; 5 figs.; 6 tabs.

17374 **(JINR—E-4-85-527) Kronecker products which decompose into two irreducible representations.** Iosifescu, M.; Scutaru, H. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 9p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700783.

The aim of the work is to determine, for the semisimple Lie algebra of types Bsub(n), Csub(n) and Dsub(n) sets of pairs of irreducible representations having the property that the Kronecker product of the representations of each pair decomposes into a direct sum of two irreducible representations. The proof uses Dynkin theorem and a calculation of dimensionalities. The pairs of representations obtained in this way are ((mΛ/sub 1/), (Asub(n)) for algebras of type Bsub(n), ((Λ/sub 1/), (mAsub(n)) for algebras of type Csub(n), and ((mΛ/sub 1/), (Asub(n-1)), ((mΛ/sub 1/), (Asub(n)), ((Λ/sub 1/), (mAsub(n-1)), ((Λ/sub 1/), (mAsub(n)) for algebras of type Dsub(n)3/where Λ sub(i) denotes the highest weig.ht of the fundamental representation (Asub(i)) and m is an arbitrary positive integer. 9 refs.

17375 **(JINR—E-4-86-40) Approximate two-soliton solution of a generalized Schroedinger equation in nuclear hydrodynamics.** Funke, H. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1986. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700784.

Submitted to the journal Theor. Math. Phys. .

The construction of an approximate two-soliton solution of a nonlinear Schroedinger equation with nonlinearity proportional to αchemical bonduchemical bond/sup 2/u - βchemical bonduchemical bond/sup 4/u via Baecklund transformation known from the cubic Schroedinger equation is proposed. It is shown that this solution has a minimal error and may be used for description of elastic nucleus-nucleus scattering in the hydrodynamic limit. 15 refs.

17376 **(JINR—E-5-85-867) Joint distributions of observables and measures with infinite values.** Dvurecenskij, A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700785.

Submitted to the Annales d'Institut Henri Poincare Sect. Physique theorique.

In the frame of the quantum logic approach to axiomatization of quantum mechanics the joint distribution of observables in measures attaining infinite values is studied. The necessary and sufficient conditions to existence of the joint distribution are given. The Hilbert space quantum logic model is investigated in more detail. 23 refs.

17377 (JINR—R-2-85-667, pp 130-142) **Gravitational waves with topological charge.** Nikolaenko, V.M. (Gosudarstvennyj Komitet Standartov Soveta Ministrov SSSR, Moscow). 1985. (In Russian). NTIS (US Sales Only), PC A08/MF A01. File Number DE87780075. (CONF-8506332—).

From Conference on the history of particle physics; Dubna, USSR (25 Jun 1985).

A criterion for existence of gravitational radiation bound with the wave equation $\Delta\Omega=0$ is studied. All the solutions of this equation describing plane gravitational waves are classified. It is revealed that plane gravitational waves can be characterized by a gravitational topological charge determining stability of these waves relatively to their continuous deformations. A special case of harmonic plane waves is investigated. The given type of gravitational radiation simulates existence of the pseudoparticle - antiparticle pair. The method of expansion into wave constituents was used to studythe principal possibility of generalization of the basic results obtained for other gravitationalfields.

17378 **(JINR—R-4-85-239) Natural coordinates for the three-body problem in adiabatic approximation.** (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1985. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701335.

Submitted to the journal J. Phys. B (Lett.).

Coordinates are introduced for the system of a, b and c particles with Msub(a), Msub(b) and Msub(c) masses. The coordinates are called natural for they transfer to Jacobi coordinates of these channels in asymptotic regions of configuration space corresponding to channels of (ac)+b, a+(bc) and (ab)+c reactions. Wave functions of adiabatic basis are coordinated with physical boundary conditions in new coordinates. 17 refs.

17379 **(JINR-R—2-85-712) On permissible space anisotropy.** Strel'tsov, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1985. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700796.

The concept of distance (coordinate) in the relativity theory is defined on the basis of radar experiment. Here the sum of distances passed by a light signal in forward and back directions is measured directly. Usually these distances are supposed to be equal. By the gauge transformation of space coordinate the permissible space anisotropy is introduced. The generalized Lorentz transformations, expressions for one-way velocities, right and left distances for nonlight signals etc. are considered. 6 refs.

17380 **(JINR-R—11-85-764) Approximate calculation of the conditional Winer integral in quantum mechanics problems. Harmonic oscillator.** Zhidkov, E.P.; Lobanov, Yu.Yu.; Sidorova, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700811.

Application of the functional integration method to obtaining some values of quantum mechanic system in the Euclidean formulation of theory is considered. The conditional Wiener integrals are calculated using our approximate formulas, which are exact for the functional polynomials of certain degree. The use of the method is demonstrated taking the harmonic oscillator as an example. The E/sub 0/, E/sub 1/ energies of the ground and first excited states of this system, propagator G(r)=<0chemical bondx(0)x(r)chemical bond0> and wave function squared of the ground state chemical bondphi/sub 0/(x)chemical bond/sup 2/ are calculated. The results are proved to be in good agreement with the theory. The evaluation of the integrals is performed using the Gauss and Chebyshev quadrature formulas. The comparison of our numerical results with the values obtained by other authors using both Monte Carlo method on the lattice and approximation of the path in the Feynman integral is presented. This comparison shows that our method is more effective. 24 refs.; 3 figs.; 4 tabs.

17381 **(JINR-R—11-85-765) Approximate calculation of the conditional Wiener integral in quantum mechanics problem. Anharmonic oscillator.** Zhidkov, E.P.; Lobanov, Yu.Yu.; Sidorova, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700812.

Application of the functional integration method to obtain some characteristics of quantum mechanics system in the Euclidean formulation of theory is considered. The conditional Wiener integrals are calculated using our approximate formulas, which are exact for the functional polynomials of certain degree. The use of the method is demonstrated taking the anharmonic oscillator with Hsub(g)=1/2(psup(2)+xsup(2))+gxsup(4) and Hsup(f)=1/2(psup(2)+xsup(2))+1/2(xsup(2)-fsup(2))sup(2) as an example. The E/sub 0/, E/sub 1/ energies of the ground and first excited states of this system, propagator G(r)=<0chemical bondx(0)x(r)chemical bond0> and wave function squared of the ground state chemical bondphi/sub 0/(x)chemical bond/sup 2/ are calculated. The evaluation of the integrals is performed using the Gauss and Chebyshev quadrature formulas. The comparison of our numerical results with the values obtained by other authors using both Monte Carlo method on the lattice and approximation of paths in the Feynman integral is presented. This comparison demonstrates a higher efficiency of the method used. 28 refs.; 5 figs.; 8 tabs.

17382 **(KFKI—1986-37/A) Comment to the reanalysis of the Eoetvoes experiment.** Vecsernyes, P. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 4p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700819.

A recent reanalysis of the classical Eoetvoes experiment - concerning the relation between the inertial and gravitational mass - shows strong correlation between the baryon number per unit mass of the samples and the deviations from the strict linearity measured by Eoetvoes. This result can be interpreted as an evidence for the existence of a new basic interaction of medium range, 'the fifth force'. Another possible candidate for carrying a new interaction is the lepton charge, the symmetric pair of the baryon charge in grand unified models. It is pointed out that the deviations from the null results in the Eoetvoes experiment do not correlate with the lepton charge per unit mass of the samples used by Eotvoes, only with their baryon charges. (D.Gy.). 4 refs.

17383 **(KFKI—1986-47/A) External field Dirac equation with separable potential.** Foeldy, L.; Toth, A.; Revai, J. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700822.

The general form of the rotation, space reflection, time reversal and charge conjugation invariant separable potential for the Dirac equation is investigated. A concrete potential is constructed which reproduces the 1s/sub 1/2/ and 2p/sub 1/2/ eigenvalues of the nuclear Coulomb potential. 3 refs.; 4 figs.

17384 **(KFKI—1986-48/A) Coulomb pair-creation.** Hrasko, P.; Foeldy, L.; Toth, A. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1986. 58p. NTIS (US Sales Only), PC A04/MF A01. File Number DE87700823.

Electron-positron pair production in strong Coulomb fields is outlined. It is shown that the singular behaviour of the adiabatic basis can be removed if solutions of the time dependent external field Dirac equation are used as a basis to expand the fermion field operator. This latter 'asymptotic basis' makes it possible to introduce Feynman-propagator. Applying the reduction technique, the computation of all of the basic quantities can be reduced to the solution of an integral equation. The positron spectrum for separable potential model with Lorentzian time dependence and for potential jump is analyzed in the pole approximation. 21 refs.; 6 figs.

17385 **(KFKI—1986-51/B) Asymptotic behaviour of Robinson-Trautman pure radiation solutions.** Bicak, J.; Perjes, Z. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Aug 1986. 4p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87700825.

It is shown that spherical Robinson-Trautman space-times filled with a homogeneous time-varying radiation field approach the Vaidya metric as the retarded time goes to infinity. This is a generalization of an earlier result on the vacuum Robinson-Trautman space-times. 5 refs.

17386 **(LA-UR—87-22) A self-similar approach to the explosion of droplets by a high energy laser beam.** Chitanvis, S.M. (Los Alamos National Lab., NM (USA)). 30 Dec 1986. Contract W-7405-ENG-36. 4p. (CONF-861038—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005124.

From OSA/APS international laser science conference ↑; 0.

A model has been constructed in which a small droplet is exploded by the absorption of energy from a high energy laser beam. The beam flux is so high that it is assumed that a plasma is formed. A single-fluid model of a plasma droplet interacting with laser radiation is used. Selfsimilarity is invoked to reduce the spherically symmetric problem involving hydrodynamics and Maxwell's equations to quadrature. It is shown analytically that the model reproduces in qualitative manner certain features observed experimentally.

17387 **(NORDITA—85/16-Prepr.) Propagator of quantum gravity in minisuperspace.** Louko, J. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). Apr 1985. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750530.

We study the quantum gravitational propagation amplitude between two spacelike three-surfaces in minisuperspaces where the supermomentum constraints are identically satisfied. We derive a well-defined path integral formula for the propagator and show that the propagator is an inverse of the canonical Hamiltonian operator. In an exactly solvable deSitter minisuperspace model the propagator is found to obey semi-classically correct boundary conditions. We discuss the implications for the full theory and suggest an approach to unravelling the physical meaning of the propagator.

17388 **General dimensional reduction of ten-dimensional supergravity and superstring.** Ferrara, S.; Porrati, M.; Kounnas, C. (California Univ., Los Angeles, USA. Dept. of Physics; California Univ., Berkeley, USA. Dept. of Physics; Lawrence Berkeley Lab., CA, USA). *Physics Letters [Section] B;* **181**: No. 3/4, 263-268(4 Dec 1986). Contract AA03-76SF00034.

Dimensional reductions of supergravity theories are shown to yield to specific glasses of four-dimensional no-scale models with N = 4, 2 or 1 residual supersymmetry. N = 1 "maximal" supergravity lagrangian, corresponding to the "untwisted" sector of orbifold

compactification of superstrings, contains nine families and has a no-scale structure based on the Kaehler manifold [SU(3, 3+3n)/ SU(3) x SU(3+3n)] x [SU(1, 1)/U(1)]. The quantum consistency of the resulting theories give information on the non Kaluza-Klein (string) "twisted" sector.

17389 **The new inflationary universe, 1984.** Guth, A.H. (Center for Theoretical Physics, MIT, Cambridge, MA 02139). pp 287-301 of Inner space/outer space. The interface between cosmology and particle physics. Kolb, E.W.; Turner, M.S.; Lindley, D.; Olive, K.; Seckel, D. Chicago, IL; University of Chicago Press (1986).

This article reviews the new inflationary universe scenario, placing particular emphasis on the basic features and motivations. This article summarizes some of the recent developments, and gives a simple explanation for the generation of density fluctuations.

17390 **Supersymmetric inflation: Recent progress.** Ovrut, B.A.; Steinhardt, P.J. pp 302-324 of Inner space/outer space. The interface between cosmology and particle physics. Kolb, E.W.; Turner, M.S.; Lindley, D.; Olive, K.; Seckel, D. Chicago, IL; University of Chicago Press (1986).

The new inflationary universe scenario is, in principle, a simple and powerful approach to resolving a large number of fundamental cosmological problems. However, in order for the scenario to be considered a complete theory, one critical question remains to be answered: What is the physics responsible for the phase transition that triggers the exponential expansion (inflation) of the universe? One possibility that the authors and several other groups have been pursuing is that the physics responsible for the phase transition involves (local) supersymmetry. The goal of this paper is to review the present status of "Supersymmetric Inflation", particularly emphasizing some very exciting results that they recently obtained.

17391 **The behavior of the Higgs field in the new inflationary universe.** Guth, A.H.; Pi, S. (Center for Theoretical Physics, MIT, Cambridge, MA 02139). pp 345-351 of Inner space/outer space. The interface between cosmology and particle physics. Kolb, E.W.; Turner, M.S.; Lindley, D.; Olive, K.; Seckel, D. Chicago, IL; University of Chicago Press (1986).

This article summarizes research concerning the quantum-mechanical treatment of the Higgs field in the context of the new inflationary universe. The research in this area is continuing, but so far a toy model is described which has been constructed and solved.

17392 **Inflation in a wall dominated universe.** Seckel, D. (MS # 209, Fermilab, P.O. Box 500, Batavia, IL 60510). pp 367-370 of Inner space/outer space. The interface between cosmology and particle physics. Kolb, E.W.; Turner, M.S.; Lindley, D.; Olive, K.; Seckel, D. Chicago, IL; University of Chicago Press (1986).

The authors examine the possibility that the Universe was, at some time in its past, dominated by topological domain walls. In particular, they discuss the possibility that such an epoch could solve the flatness and horizon problems. They conclude that such a model would not work. The problems of baryogenesis and density perturbations are discussed.

17393 **More dimensions - Less inflation.** Lindley, D. (MS# 209, Fermilab, P.O. Box 500, Batavia, IL 60510). pp 593-596 of Inner space/outer space. The interface between cosmology and particle physics. Kolb, E.W.; Turner, M.S.; Lindley, D.; Olive, K.; Seckel, D. Chicago, IL; University of Chicago Press (1986).

Even if the extra dimensions are stable today, it is an exciting idea that at an earlier cosmological time they may have been dynamically important. The major problem that arises is that somehow the extra dimensions must stop evolving, and settle into a stable, static configuration. In this simple model, this allows quantitative estimates of the consequences of such an unusual period in the early history of the Universe.

17394 **Supergravity: The basic and beyond.** de Wit, B.; Freedman, D.Z. (Inst. for Theoretical Physics, Utrecht). pp 135-210 of Supersymmetry. Dietz, K.; Flume, R.; Gehlen, G.; Rittenberg, V. New York, NY; Plenum Press (1985). (CONF-8408127—).

From NATO advanced study institute on supersymmetry; Bonn, F.R. Germany (20 Aug 1984).

The authors present the basics of supergravity in detail, assuming only some previous knowledge of Lagrangian field theory and some exposure to general relativity and tensor calculus. This is followed by an introduction to supergravity in antideSitter space, some of the ideas of the off-shell multiplet structure important for the construction of phenomenological models based on matter-coupled supergravity, and a recent Kaluza-Klein solution to 11-dimensional supergravity which clarifies the relation to gauged $\nu=8$ supergravity in four dimensions.

17395 **Towards a theory of fermion masses: A two-loop finite $\nu=1$global SUSY GUT.** Jones, D.R.T.; Raby, S. (Univ. of Colorado, Boulder, CO). pp 647-665 of Supersymmetry. Dietz, K.; Flume, R.; Gehlen, C.; Rittenberg, V. New York, NY; Plenum Press (1985). (CONF-8408127—).

From NATO advanced study institute on supersymmetry; Bonn, F.R. Germany (20 Aug 1984).

The authors discuss the constraints on fermion masses resulting from the requirement of finiteness in an $\nu=1$ supersymmetric theory. The presentation includes: conditions for finiteness, construction of a two-loop finite SU_5 gut, fermion masses, top quark mass, and a generalized two-loop finite SU_5 gut.

70 FUSION ENERGY

REFER ALSO TO CITATION(S) 16160

7001 Plasma Research

REFER ALSO TO CITATION(S) 16487, 17356, 17441, 17442, 17443, 17444, 17445, 17446, 17447, 17449, 17450, 17457, 17468, 17469, 17470, 17471, 17473, 17474, 17475, 17476, 17477, 17481, 17482, 17483, 17483

17396 **(CEA-CONF—8489) Electron acceleration by a localized electric field.** Galmiche, D.; Nicolle, J.P.; Pesme, D. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Nov 1985. 38p. (CONF-851128—4). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750565.

From 17. European conference on laser interaction with matter; Rome, Italy (18 Nov 1985).

The acceleration of test electrons by a resonant one - dimensional electric structure is studied in the convective regime with the Zakharov equations. Depending on the nonlinearity level the particle acceleration is due to diffusion or trapping by the plasma wave. Electron distributions are obtained and compared with 1-D particle code results. Influence of Landau damping formulation is discussed.

17397 **(CEA-CONF—8492) Pulsed soft X-ray source for laser plasma diagnostics calibrations.** Bourgade, J.L.; Cavailler, C.; Mascureau, J. de; Miquel, J.L. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Mar 1986. 16p. (CONF-860324—33). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750457.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

Improvement in laser-plasma analysis makes it necessary to perform accurate calibration in the soft X-ray range. For this purpose we have modified a plasma Focus device (27 kJ, 40 kV, 400 kA) in order to enhance its soft X-ray emission: a hollow anode is used to prevent hard X-ray bremsstrahlung emission and a lot of filling gases are chosen for their characteristic lines in the keV and sub-keV range (Ne, Ar, O, N, CH_4). These emissions have been absolutely measured with a X-ray bolometer and can be used directly or indirectly (in the fluorescent mode: Mg Kα at 1.254 keV) for X-ray calibration of various diagnostics. Some detector calibrations in

pulsed regime (10 ns) are presented (Films, solid state PIN diodes, CCD arrays).

17398 **(CEA-CONF—8496) Absorption of aluminium X-ray lines in a laser created gold plasma.** Combis, P.; Busquet, M.; Louis-Jacquet, M. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Apr 1986. 7p. (CONF-8604224—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750566.

From International colloquium on X-ray lasers; Aussois, France (14 Apr 1986).

We have studied the absorption of aluminium X-ray lines through a gold plasma by focusing a high intensity laser-beam onto a specific target. Absorption in the wavelength range of 5 to 7 A has been evidenced and measured for Aluminium resonance lines.

17399 **(CEA-CONF—8512) Approximation of Fokker-Planck equation by a deterministic particle method.** Hermeline, F. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). May 1986. 27p. (In French). (CONF-8605206—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750563.

From National congress on numerical analysis; Port Barcares, France (26 May 1986).

Fast ion transport in a plasma of electrons and ions is studied. The equation is simplified and discretized by a deterministic particle method. The way to computerize the method is shown. The energy deposition of ions in the plasma is calculated. Numerical applications are given (8 ref., 12 figs.).

17400 **(DOE/ER/10005—T1) Plasma diagnostics: Detection of laser scattering: Final report, September 1, 1978 to August 31, 1982.** Dutta, J.M.; Jones, C.R. (North Carolina Central Univ., Durham (USA). Dept. of Physics). [1985]. Contract FG05-78ER10005. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004416.

Submillimeter (SMM) radiation is the optimum radiation to use in studying some parameters of plasmas produced in Tokamak machines. The ultimate objective has been in constructing a low-noise SMM receiver suitable for application to the diagnosis of Tokamak plasmas. In this connection, a compact, stable SMM laser has been designed and constructed, and its performance as a local oscillator in the heterodyne detection has been tested. The performance of Schottky diodes as mixer elements has been evaluated by utilizing them in a quasi-optical modulation for the heterodyne generation of tunable sidebands.

17401 **(DOE/ET/53088—267) Simulation of ion cyclotron resonance heating through resonant absorption in two-ion species plasma.** Tajima, T.; Riyopoulos, S.; Demchenko, V. (Texas Univ., Austin (USA). Inst. for Fusion Studies; AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). Jan 1987. Contract FG05-80ET53088. 14p. (IFSR—267). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004852.

Particle simulation of two-ion hybrid cyclotron resonance heating (ICRH) of a magnetized hydrogen plasma with deuteron minority by magnetosonic waves launched from the low magnetic field side is reported. Depending on the minority concentration, partial transmission and partial reflection of the incoming waves off the two-ion hybrid resonance layer occur, in contrast to the mode conversion mainly taking place during incidence from the high field side. Preferential minority heating is observed, as the minority cyclotron resonance is close to the two-ion hybrid resonance layer.

17402 (INIS-mf—10556-Vol.1, pp 144-149) **Magnetic reconnection in tokamaks.** Wesson, J.A. (JET Joint Undertaking, Abingdon, UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Four types of magnetic reconnection occurring in tokamaks play an important role in tokamak operation. They are known as the tearing mode, the sawtooth reconnection, the double tearing mode, and the disruption. Although not observed directly, their effects are detected in a wide range of diagnostic measurements. The basic properties of each type of reconnection and their topology in particular are discussed in detail. General theoretical ideas are illustrated by examples of experimental and numerical results. For better understanding of the subject, close cooperation with astrophysicists might be helpful. (J.U.).

17403 (INIS-mf—10556-Vol.1, pp 190-191) **Reverse flow and current filamentation in the nonlinear tearing mode.** Steinolfson, R.S. (Saint Andrews Univ., UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

When adequately resolved in numerical simulations, the convective velocity term produces reverse flow vortices inside the resistive diffusion layer for the physically interesting case of high Lundquist number (S ≧ 10/sup 4/) and long wavelength disturbances. These reverse vortices generate electric fields which ultimately give rise to magnetic topology changes (formation of an additional magnetic island) and current filamentation not seen in simulations at lower S values.

17404 (INIS-mf—10556-Vol.1, pp 170-176) **Radiation from turbulent plasmas.** Kuijpers, J. (Rijksuniversiteit Utrecht, Netherlands. Sterrewacht Sonnenborgh). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

Under astrophysical conditions the turbulent plasma state is very often met. Simultaneously, the high brightness temperature of the observed plasma radiation shows the importance of collective interactions. The first step in understanding radiation from turbulent plasmas is the weak turbulence theory. Within the framework of weak turbulence the following distinct emission processes are discussed: Cherenkov resonance, three wave coupling, and wave scattering on particles. The most important astrophysical applications of these processes are described. However, in a number of astrophysical situations it is still not clear how the detailed conversion of plasma waves into escaping radiation proceeds. For better understanding of strong turbulence effects further development of the strong turbulence theory is necessary. (J.U.).

17405 (INIS-mf—10556-Vol.1, pp 177-185) **Solitons in astrophysics.** Roberts, B. (Saint Andrews Univ., UK). 1984. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700737. (CONF-8408138—Vol.1).

From 6. general conference of the European Physical Society; Prague, Czechoslovakia (27 Aug 1984).

There are strong theoretical grounds and some supporting (but inconclusive) observational grounds for expecting solitons to occur in astrophysical plasmas, such as the Sun, the solar wind, and the magnetosphere. Solitons may arise whenever nonlinearity is balanced by dispersion. The large time and length scales of astrophysical plasmas favour the development of nonlinearity. Two causes of dispersion are reviewed, adopting the ideal MHD equations together with the generalized form of Ohm's law including the Hall current. Dispersion then arises either because of ion inertial effects or from inhomogeneities in the equilibrium state. A number of well-known equations are obtained including the Korteweg-de Vries, modified Korteweg-de Vries, derivative nonlinear Schroedinger, nonlinear Schroedinger, and Benjamin-Ono equations. The behaviour of both Alfven and magnetoacoustic waves is examined.

17406 **(IPP—2/280) Method to measure the suprathermal density distribution by electron cyclotron emission.** Tutter, M. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). May 1986. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750502.

Electron cyclotron emission spectra of suprathermal electrons in a thermal main plasma are calculated. It is shown that for direction of observation oblique to the magnetic field, which decays in direction to the receiver, one may obtain information on the spatial density distribution of the suprathermal electrons from those spectra.

17407 (IPP—III/112) Evolution of radiation power profiles in ASDEX H-mode discharges. Mueller, E.R.; Janeschitz, G.; Smeulders, P. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Feb 1986. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750504.

The paper compares radiation power profiles, energy exhaust and impurity radiation mechanisms of the two types of H-mode during neutral-injection heated divertor discharges in the tokamak ASDEX. The normal H-mode discharge that reaches a quasi-stationary state is characterized by moderate radiation power losses of the main plasma and by repetitive burst-like energy release from its outer half-radius zone into the divertor. In contrast, the burst-free variant of the H-mode shows superior energy and particle transport properties but becomes dominated by radiation power losses growing continuously up to 100% of the heating power input. The dynamic behaviour, i.e. the variation in time, of the iron concentration and the associated radiation power density at the plasma centre is hardly influenced by the kind of H-mode. But, if the concentration of metals with medium Z-value is raised to sufficiently high values in the burst-dominated H-mode plasma, e.g. by the accumulation of intrinsic iron, the burst-free (or burst-deficient) H-mode is triggered, which after a new accumulation period usually ends by a radiation collapse.

17408 (ITF—85-80-R) Echo in a magnetized low-turbulent plasma. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1985. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701324.

The phenomena of spatial and temporal echoes in a magnetized plasma with lower hybrid turbulence are investigated theoretically. The echo signal is nonlinear response of the plasma to two successive external perturbations of the plasma density. Analytical expressions for the shape of the echo signal are found. 19 refs.; 2 figs.

17409 (ITP—85-73-E) Short-wave convective turbulence and anomalous electron thermal conductivity of a plasma. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1985. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701326.

Short-wave convective turbulence may be a cause of anomalous electron transport in a magnetically confined plasmas. The general statistical approach is applied to obtain stationary spectra of the short-wave convective plasma turbulence and to calculate the coefficients of turbulent electron thermal conductivity. 26 refs.

17410 (KFTI—85-6) Non-linear stage of beam instability in the absence of electron capture by a wave field. Rutkevich, B.N.; Rutkevich, P.B. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700826.

The system of two electron beams with V/sub 1/ and V/sub 2/(V/sub 1/ > V/sub 2/) velocities and equal densities (n/sub 1/ =n/sub 2/) is considered. The energy electron spread for each beam is assumed to be sufficiently small to avoid electron capture by the field of volumetric charge wave. Electrons move in space between two parallel conducting planes in a flat layer of small thickness 2R. Interplane distance 2H is arbitrary. The problem of development of beam instability is solved with provision for dispersion and weak non-linearity. Non-linear equation for a amplitude as a function of distance zeta is derived: S/sub 1/(d/sup 2/a)/(d zeta/ sup 2/))=S/sub 2/a+S/sub 3/a/sup 3/. The latter equation assumes solutions of two types: monotonously increasing one (at S/ sub 3/ > 0) and periodical one (at S/sub 3/ < 0), under conditions of linear instability (a/sub 1/ and a/sub 2/ coefficients are positive). In the case of ion compensation of a constant component of volumetric electron charge change of these conditions (S/sub 3/=0) is realized at p=((v/sub 1/-v/sub 2/)/w p=(v sub(1)-v sub(2)/w sub(p)$\sqrt{}$hH)=1.73, where w sub(p)=(4πl sup(2)n/m)sup(1/2), n/ sub 0/=n/sub 1/+n/sub 2/. At lower values of P parameter an explosive instability is observed and at higher values nonlinear stabilization occurs. 9 refs.

17411 (LA-UR—86-4153) Opacity calculations for laser plasma applications. Magee, N.H. Jr. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 15p. (CONF-861177—4). NTIS MF A01; 2; GPO Dep. File Number DE87003728.

From 9. international conference on lasers and applications; Orlando, FL, USA (3 Nov 1986).

The Los Alamos LTE light element detailed configuration opacity code (LEDCOP) has been revised to provide more accurate absorption coefficients and group means for modern radiation-hydrodynamic codes. The new group means will be especially useful for computing the transport of thermal radiation from laser deposition. The principal improvement is the inclusion of a complete set of accurate and internally consistent LS term energies and oscillator strengths in both the EOS and absorption coefficients. Selected energies and oscillator strengths were calculated from a Hartree-Fock code, then fitted by a quantum defect method. This allowed transitions at all wavelengths to be treated consistently and accurately instead of being limited to wavelength regions covered by experimental observations or isolated theoretical calculations. A second improvement is the use of more accurate photoionization cross sections for excited as well as ground state configurations. These cross sections are now more consistent with the bound-bound oscillator strengths, leading to a smooth transition across the continuum limit. Results will be presented showing the agreement of the LS term energies and oscillator strengths with observed values. The new absorption coefficients will be compared with previous calculations. 5 refs., 9 figs., 1 tab.

17412 (LRP—306/86) Broadband magnetic and density fluctuations in the TCA tokamak. Hollenstein, Ch.; Keller, R.; Pochelon, A.; Ryter, F.; Sawley, M.L.; Simm, W.; Weisen, H. (Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland)). Sep 1986. 23p. (CONF-860711—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE87900430.

From Small scale turbulence and anomalous transport in magnetized plasmas; Cargese, France (7 Jul 1986).

The results of comparative studies of broadband magnetic and density fluctuations during ohmic discharges in the TCA tokamak are described. Long coherence lengths are observed in poloidal and toroidal directions between magnetic probes in the scrape-off layer. A phase contrast diagnostic provides a newly accessible range of density fluctuations in the bulk plasma with very long wavelengths. Langmuir probes provide similar measurements in the scrape-off layer. Statistical dispersion relations for both density and magnetic fluctuations are deduced and are shown to be substantially different. Low mean poloidal wavenumbers ($m \sim 2$ at 100 kHz) are obtained for the magnetic fluctuations, in contrast to the much higher values measured for density fluctuations. The difference between magnetic and density fluctuations is also reflected in different scalings with plasma parameters and with electron confinement time. The helicity of the coherent magnetic structures is analyzed to show that interior regions of the plasma, such as the $q = 2$ region, contribute to the magnetic activity at the edge. This explains why the magnetic fluctuations measured at the edge are likely to reflect the confinement properties of the bulk plasma. The results of detailed probe rotation experiments and coherence measurements give indications of the physical nature and origin of magnetic fluctuations.

17413 (N—87-13307) Space plasma research. Final report, August 1980-August 1986. Comfort, R.H.; Horwitz, J.L. (Alabama Univ., Huntsville (USA)). Sep 1986. 26p. (NASA-CR—178965; NAS—1.26:178965). NTIS, PC A03/ MF A01.

Four basic areas were covered: development of analysis techniques and software and numerical simulations; data analysis and interpretation; spacecraft sheath studies; and laboratory studies. The important details were documented in terms of either appropriate software documentation or publication in referred publication, conference proceeding and technical reports. The major accomplishments are summarized, followed by a chronological listing of the publications and presentations which resulted from the research.

17414 **(NIIEFA-P-K—0681) Calibration of thermonuclear neutron detectors.** Burtsev, V.A.; Kuz'min, V.A.; Loskutov, N.A.; Popytaev, A.N.; Ramendik, Z.A.; Titov, V.A.; Shchebolev, V.T. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700845.

Experiments dealing with determination of efficiency of different devices developed for diagnostics of neutron radiation of dense thermonuclear plasma on pulsed facilities are described. Technique for calibration of scintillation detectors not requiring use of pulsed neutron sources is suggested. Ratios for determination of accuracy of neutron fluence measuring by means of scintillation detectors are obtained. 25 refs.; 6 figs.

17415 **(ORNL/TM—9475) The "ring killer" experiment: Electron confinement in the ELMO Bumpy Torus without the influence of hot-electron rings.** Hillis, D.L.; Wilgen, J.B.; Cobble, J.A.; Davis, W.A.; Hiroe, S.; Rasmussen, D.A.; Richards, R.K.; Uckan, T.; Jaeger, E.F.; Hankins, O.E. (Oak Ridge National Lab., TN (USA)). Nov 1986. Contract AC05-84OR21400. 30p. NTIS, PC A03/MF A01; GPO Dep. File Number DE87005270.

The ELMO Bumpy Torus (EBT) [Plasma Physics and Controlled Nuclear Fusion Research (IAEA, Vienna, 1975), Vol. II, p. 141] normally has an energetic electron ring in each of its 24 mirror sectors. The original intention of using this hot-electron population was to provide an average local minimum in the magnetic field (through its diamagnetism) to stabilize the simple interchange and flute modes, which otherwise are theoretically inherent in a closed-field-line bumpy torus. To study the confinement properties of a bumpy torus without the influence of hot-electron rings, a water-cooled stainless steel limiter in each mirror sector was extended into the plasma to the ring location; this eliminated the hot-electron ring population. These limiters were aptly named "ring killers." Electron temperature, density, space potential, and plasma fluctuations have been measured during the ring killer experiment and are compared to standard EBT operation. The results of these experiments indicate that the hot-electron rings in EBT do enhance the core plasma properties of EBT and do, in fact, reduce plasma fluctuations; however, these improvements are not large in magnitude. These measurements and recent theoretical models suggest that simple interchange/flute modes are stabilized, or fluctuation levels reduced, well before that condition is obtained for average minimum-B stabilization. Several possible mechanisms for this stabilization are discussed.

17416 **(RISO-M—2594) Electron cyclotron resonance heating of a high-density plasma.** Hansen, F.R. (Risoe National Lab., Roskilde (Denmark); Danmarks Tekniske Hoejskole, Lyngby). Jul 1986. 90p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87750857.

Various schemes for electron cyclotron resonance heating of tokamak plasmas with the ratio of electron plasma frequency to electron cyclotron frequency, ω/sub pe//ω/sub ce/, larger than 1 on axis, are investigated. In particular, a mode conversion scheme is investigated using ordinary waves at the fundamental of the electron cyclotron frequency. These are injected obliquely from the outside of the tokamak near an optimal angle to the magnetic field lines. This method involves two mode conversions. The ordinary waves are converted into extraordinary waves near the plasma cut-off layer. The extraordinary waves are subsequently converted into electrostatic electron Bernstein waves at the upper hybrid resonance layer, and the Bernstein waves are completely absorbed close to the plasma centre. Results are presented from ray-tracing calculations in full three-dimensional geometry using the dispersion function for a hot non-relativistic plasma. Radial profiles for the power deposition and the non-inductive wave-driven current due to the Bernstein waves are calculated for realistic antenna radiation patterns with parameters corresponding to the Danish tokamak DANTE and to Princeton's PLT. With 1 tab., 28 figs., 38 refs.

17417 **(UCID—17530-87-Rev.6) The Computational Physics Program of the National MFE Computer Center.** Mirin, A.A. (Lawrence Livermore National Lab., CA (USA)). Jan 1987. Contract W-7405-ENG-48. 52p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005268.

The computational physics group is involved in several areas of fusion research. One main area is the application of multidimensional Fokker-Planck and transport codes to tokamaks and compact toroids. Another major area is the investigation of resistive magnetohydrodynamics in three dimensions, with applications to compact toroids and reversed field pinches. A third major area is the investigation of kinetic instabilities using a 3-D particle code. This work is often coupled with the task of numerically generating equilibria which model experimental devices. In addition to these computational physics studies, the group is making a major effort at ascertaining how to efficiently utilize multiprocessor computers.

17418 **Determination of gross plasma equilibrium from magnetic multipoles.** Kessel, C.E.; Firestone, M.A. (Fusion Engineering and Physics Program, Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1177-1184(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A new approximate technique to determine the gross plasma equilibrium parameters, major radius, minor radius, elongation and triangularity for an up-down symmetric plasma is developed. It is based on a multipole representation of the externally applied poloidal magnetic field, relating specific terms to the equilibrium parameters. The technique shows reasonable agreement with free boundary MHD equilibrium results. The method is useful in dynamic simulation and control studies.

17419 **An alpha particle distribution function for mirror loss-cone type instability calculations.** Ho, S.K.; Smith, G.R.; Nevins, W.M.; Miley, G.H. (Fusion Studies Lab., Dept. of Nuclear Engineering, Univ. of Illinois, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 1171-1176(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The modeling of the steady-state fusion-born alpha particle distribution in a mirror loss-cone is investigated. The Legendre function expansion and diffusion-front methods are reviewed and examined. The diffusion-front method is shown to be am accurate and efficient method are alpha-loss-cone instability calculations in a tandem mirror fusion device.

17420 **Recent operation of the tandem mirror experiment-upgrade.** Hill, D.N. (Lawrence Livermore National Lab., Livermore, CA). pp 2P-1 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—). Contract W-7405-ENG-48.

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

The authors discuss current results of thermal barrier operation of TMX-U. In this device, axial particle confinement is provided by increased electrostatic potentials in the outboard mirror cells (end plugs). These potential peaks are sustained by a combination of neutral-beam injection and high-power (250 kW per plug) microwave heating (ECRH) at both the fundamental and second harmonic of the electron-cyclotron frequency. At the plug midplane, the second harmonic ECRH produces a potential minimum (the thermal barrier), which reduces the flow of cold electrons to the regions of high ion-confining potential. Recent experiments have examined thermal barrier formation at central-cell densities (n/sub cc/ — 10/sup 12/ cm/sup -3/), using data from several new diagnostics, including an end-loss ion spectrometer and a system of X-ray spectrometers. Related experiments have sought to increase the energy confinement of hot mirror-trapped ions in the central cell. This is important for thermal-barrier operation because barrier filling by cold ions escaping from the central cell can limit high density operation. Analysis of data from a charge-exchange analyzer and Thomson scattering shows that the energy confinement is

limited by a combination of charge exchange and electron drag. Current efforts at reducing the charge exchange loss are focused on control of the edge-plasma density, temperature, and fueling using both ion-cyclotron rf heating and a set of biased limiter plates to inject low energy neutrals into the core plasma. New information about neutral penetration and fueling efficiencies under these conditions has been provided by a high speed camera imaging Balmer-alpha emission from atomic neutrals.

17421 **Neutral beam probe for potential measurements in Phaedrus minimum-B end plug.** Saadatmand, K.; Woo, J.T. (Interscience, Inc., Troy, NY). pp 2C-5 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

A principal mission of the Phaedrus tandem mirror experiment at the University of Wisconsin is to study techniques and effects of shaping the axial and radial ambipolar potential profiles. The Phaedrus end plug can be operated in either axisymmetric or minimum-B configurations and the three-dimensional space charge potential distributions in both cases are of interest. The authors have developed a neutral beam probe system design capable of mapping out both axial and radial potential profiles throughout most of the end plug regions of interest. The design features a cesium ion beam that is swept both axially and radially, coupled to a cesium curtain neutralizer to form the neutral primary beam. The singly ionized secondaries are detected by a parallel plate electrostatic energy analyzer with an elongated entrance aperture aligned along the axis of the end plug system. The secondaries originating from different spatial points can be directed into the slit aperture by energy modulation of the primaries. For axisymmetric end plugs, the trajectories remain in a plane. The effect of the quadrupoles associated with the minimum-B configuration is to introduce a shear along the axis, which is accommodated by the use of this split aperture. Therefore, a single diagnostic implementation can be used to map out the three dimensional space charge potential distributions in the end plugs for both the simple mirror and minimum-B configurations. An option to include multiple sources also aligned along the system axis is also included to provide the capability for measuring the wavelength of the fluctuations. The basic design appears to be quite general and should be scalable to other tandem mirror systems. For the parameters of the Phaedrus experiment, spatial resolutions on the order of fractional cubic centimeters and sensitivity of several volts are expected.

17422 **Nd:Glass lasers for Thomson scattering plasma diagnostics on the compact toroid transport experiment.** Dooling, J.C.; Niimura, M.; York, T.M. (Depts. of Electrical and Aerospace Engineering, The Pennsylvania State Univ., University Park, PA). pp 2C-2 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

A high-brightness, low-divergence Nd:Glass laser system for Thomson scattering plasma diagnostics is described. The laser oscillator operates in the TEM/sub oo/ mode; its output beam is then amplified sing two or three single-pass Nd:Glass amplifiers for maximum output energies at 1054 nm in the range of 10 to 60 Joules. Experimentally determined laser parameters are described. KDP crystals are also employed for second harmonic generation (SHG) for Thomson scattering experiments at 527 nm. Detection of the scattered photons at 1054 nm and 527 nm is accomplished using avalanche photodiodes (APDs) and photo multiplies tubes (PMTs), respectively. Though the detection of low light level signals is straightforward with PMTs, respectively, this is not the case with APDs. Silicon APDs have high quantum efficiencies (35-40 percent at 1054 nm) but relatively low gain (50-100). The APD output must be amplified considerably in order to compete with the PMT operating in the neighborhood of 527 nm. An amplification system to overcome this problem is presented. Also, a gain monitoring system for insitu measurements allowing for absolute gain determination on each Thomson scattering shot has been developed for the APDs. Temperature and density measurements from Thomson scattering tests conducted on the Compact Toroid Transport Experiment (CTTX) are presented. This data are compared with results from other diagnostics used on CTTX, such as spectroscopy and diamagnetic loops.

17423 **Parallel current flow in the Phaedrus tandem mirror machine.** Brouchous, D.A.; Breun, R.A.; Severn, G.D.; Sing, D. (Nuclear Engineering Dept., Univ. of Wisconsin, Madison, WI). pp 2P-3 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

MHD equilibrium in a tandem mirror with quadrupole end cells requires currents to flow parallel to magnetic field lines in the presence of high beta plasma. These currents have a quadrupole nature and give a net current of zero. Experiments have been performed in the Phaedrus tandem mirror device in order to measure parallel current densities in the central cell and transition regions. Three types of diagnostics were used to measure current densities; Rogowsky loops, magnetic pickup coils, and two sided Langmuir probes. A net current of 45 amps flowing toward the east plug was measured in the Phaedrus central cell. A quadrupole current is seen near the axis when the 45 amp net current is subtracted from local current measurements. Current measured with collecting rings mounted on the end walls show 10 amps of current flowing to the east end wall. Possible causes of the 45 amp current include an asymmetry in plug potentials between the east and west plugs, and an off axis density peak in the central cell.

17424 **High-frequency broadband emission from turbulent plasmas.** Weatherall, J.C.; Hobbs, W.E. (General Dynamics, Pomona Div., P.O. Box 2507, Pomona, CA). pp 3C-6 of IEEE conference record-abstracts of the 1985 IEEE international conference on plasma science. Piscataway, NJ; IEEE Service Center (1985). (CONF-850699—).

From Conference on plasma sciences; Pittsburgh, PA, USA (3 Jun 1985).

Super-strong turbulence in beam-plasma systems is characterized by intense, broadband radiation. While emission near the plasma frequency and near twice the plasma frequency can be studied by weak turbulence theory as the interaction of Langmuir waves in the plasma, the apparent radiation at higher frequencies is puzzling. Evidently at large amplitude the turbulence exhibits a broad frequency response above the plasma frequency. The authors investigate the possibility that this is due to the non-sinusoidal waveform of large amplitude charge-density waves. The model for the electrostatic turbulence is a monochromatic wave solution for a large amplitude plasma wave in a cold plasma. This solution exhibits considerable electron bunching and, because of the amplitude-dependent shape of the waveform, higher harmonic components. The authors do not solve for the time evolution of the wave beyond the simple time behavior of the initial wave oscillation. The source region is assumed to have a finite size. Then the calculation of the electromagnetic vector potential is done by standard methods for simple radiating systems. The resulting power radiated is expressed in terms of a coupling efficiency which represents the fraction of plasmon energy lost per cycle per unit solid angle per electron into the s-harmonic of the plasma frequency. The coherent radiation is proportional to the square of the number of radiating electrons in the system. The radiation power spectrum depends sensitively on the wave amplitude and the size of the (coherent) source region. When the scalelength of the emitting region is much larger than a radiative wavelength, the emission can be predominantly in the higher harmonics. The theory also predicts that the higher harmonic emission is beamed at small angles relative to the direction of the Langmuir oscillation.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 15760, 17308, 17397

17425 **(CEA-CONF—8421) Tritium detection in installations and in environment.** Calando, J.P. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Apr 1986. 31p. (In French). (CONF-8604266—3). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750560.

From Tritium meeting; Dijon, France (23 Apr 1986).

The different tritium detection devices in the atmosphere are reviewed: ionization chamber, proportional counters, Peltier effect, bubble-through device. Characteristics of those allowing to quantify the HTO form (more "radiotoxic" than T_2 form) are emphasized.

17426 **(CEA-CONF—8511) Composite beryllium-ceramics breeder pin elements for a gas cooled solid blanket.** Carre, F.; Chevreau, G.; Gervaise, F.; Proust, E. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 28p. (CONF-860551—11). NTIS (US Sales Only), PC A03/MF A01. File Number DE87750570.

From Technical meeting and workshop on fusion reactor design and technology; Yalta, USSR (26 May 1986).

Helium coolant have main advantages compared to water for solid blankets. But limitations exist too and the development of attractive helium cooled blankets based on breeder pin assemblies has been essentially made possible by the derivation from recent CEA neutronic studies of an optimized composite beryllium/ceramics breeder arrangement. Description of the proposed toroidal blanket layout for Net is made together with the analysis of its main performance. Merits of the considered composite Be/ceramics breeder elements are discussed.

17427 **(CEA-CONF—8516) Development of large components for the fusion reactor vacuum circuits.** Perinic, D.; Lorrain, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 7p. (CONF-860603—14). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750569.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

The Commission of the European Communities appointed in mid-1983 the Centre d'Etudes Nucleaires de Saclay and the Kernforschungszentrum Karlsruhe GmbH to investigate whether large vacuum components for use in the fusion machine can be built. The following individual targets have been defined for studies under this project: Elaboration of technical specifications for large components. Investigation of the feasibility. Specification of the tests required and planning of a testing facility. The plasma chamber pumping system is essentially concerned.

17428 **(CEA-CONF—8517) Study of a breeding material - γ lithium aluminate.** Roth, E.; Botter, F.; Rasneur, B. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 11p. (CONF-860603—13). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750568.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

Attractive properties are thermal stability, weak corrosion of structures at the expected working temperatures, satisfactory irradiation behaviour and tritium release. Within the EEC fusion technology program, a thorough investigation of this compound has been undertaken by CEA since 1982. Our main effort has addressed the following aspects which are detailed in this paper: Fabrication. Characterization namely physico-chemical, thermal, mechanical. Compatibility with 316 L stainless steel. Irradiation behaviour. Study of the mechanism and kinetics of tritium release both from out of pile and in pile experiments. The influence of the material microstructure and of fabrication procedures on the relevant properties has been specially looked into.

17429 **(CEA-CONF—8523) Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor.** Lefevre, F.; Thevenot, G.; Rasneur, B.; Botter, F. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1986. 18p. (CONF-860605—35). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750567.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Studies about controlled fusion reactor of the Tokamak type require the examination of the radiation effects on the behaviour of various potential materials. Thus, in the first part of this paper, are presented the devices adapted to these materials studies and used in the OSIRIS reactor. In a second part, is described an experiment of irradiation ceramics used as candidates for breeding material and are given the first results.

17430 **(CEA-CONF—8557) PHEBUS: a new powerful laser facility for ICF research.** Andre, M.; Coudeville, A.; Dautray, R. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Sep 1986. 4p. (CONF-860917—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750461.

From 14. SOFT - symposium on fusion technology; Avignon, France (8 Sep 1986).

The new laser system called Phebus recently settled by the Centre d'Etudes of Limeil-Valenton is presented, together with the wide range of diagnostic tools allowed to be setted in the vacuum vessel. Research directions of target fabrication are also given.

17431 **(CEA-CONF—8564) Model for the acceleration of laser irradiated targets.** Babonneau, D.; Di Bona, G.; Fortin, X. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Nov 1986. 23p. (CONF-8610162—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE87750571.

From 7. international workshop on laser interaction and related plasma phenomena; Monterey, CA, USA (28 Oct 1986).

Starting from the self-similar propagation of an electronic conduction wave and the consequent ablation pressure, we describe, in a simplified way, the shock ahead of this wave, then the effects of the rarefaction and compression waves which follow the shock emergence at the target rear surface. So, we obtain the temporal evolution of the rear velocity which is compared with the experimental one. For thick targets, the shock alone is able to emerge during the experimental time and consequently gives the velocity vsub(min). For thin targets, besides the shock accumulation mechanism, it is necessary to take into account the electronic heat wave emergence that is to say the "complete" ablation of the target which gives the velocity vsub(max).

17432 **(CONF-870301—10) Maintenance features of the Compact Ignition Tokamak fusion reactor.** Spampinato, P.T.; Hager, E.R. (Oak Ridge National Lab., TN (USA); GA Technologies, Inc., San Diego, CA (USA)). 1987. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004062.

From International topical meeting on remote systems and robotics in hostile environments; Pasco, WA, USA (29 Mar 1987).

The Compact Ignition Tokamak (CIT) is envisaged to be the next experimental machine in the US Fusion Program. Its use of deuterium/tritium fuel requires the implementation of remote handling technology for maintenance and disassembly operations. The reactor is surrounded by a close-proximity nuclear shield which is designed to permit personnel access within the test cell, one day after shutdown. With the shield in place, certain maintenance activities in the cell may be done hands-on. Maintenance on the reactor is accomplished remotely using a boom-mounted manipulator after disassembling the shield. Maintenance within the plasma chamber is accomplished with two articulated boom manipulators that are capable of operating in a vacuum environment. They are stored in a vacuum enclosure behind movable shield plugs.

17433 **(IAEA-R—3178-F) Impact desorption cross section studies of impurity release into magnetically confined plasmas. Final report for the period 1 July 1982-31 December 1985.** (International Atomic Energy Agency, Vienna (Austria)). Feb 1986. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701284.

This report covers two distinct topics, the experimental measurement of cross sections for the desorption of oxygen induced by ion bombardment, and a study of the surface damage on the electron induced desorption of oxygen from tungsten. The desorption of oxygen induced by ion bombardment was studied for thin oxide layers on Mg, Si, and Al targets using 4 keV Ar ions and for absorbed oxygen on MgO using Kr, Ar, Ne, and He ions of 4 keV. 17 refs, 9 figs, 2 tabs.

17434 **(IAEA-TECDOC—388) Fusion safety status report.** (International Atomic Energy Agency, Vienna (Austria)). Oct 1986. 324p. NTIS (US Sales Only), PC A14/MF A01. File Number DE87700709.

This report includes information on a) tritium handling and safety; b) activation product generation and release; c) lithium safety; d) superconducting magnet safety; e) operational safety and shielding; f) environmental impact; g) recycling, decommissioning and waste management; and h) accident analysis. Recommendations for high priority research and development are presented, as well as the current status in each area. 322 refs, 7 figs, 8 tabs.

17435 **(IPP—9/47) Surface analysis of a central part of the JET graphite limiter.** Ehrenberg, J.; Behrisch, R. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Jun 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750506.

The content of this report was previously published in IPP-JET–23.

A central part (tile 4) of the carbon limiter of JET from octant 4, which was used in the period from July 1983 to December 1983 was analysed with regard to its surface composition and topography by PIXE, RBS, SEM and EIXE. For reference, a graphite sample from a limiter tile which had not been incorporated in JET and a section of a graphite piece cut from the limiter were also investigated. The elements found most frequently on the rough (propor to10 μm) graphite surface were Mo (10/sup -20/-10/sup 21/ atoms/m/sup 2/), Ni (10/sup 20/-10/sup 21/ atoms/m/sup 2/), Cr (10/sup 19/-10/sup 20/ atoms/m/sup 2/), Fe (10/sup 19/-10/sup 20/ atoms/m/sup 2/), Ti (10/sup 18/-10/sup 19/ atoms/m/sup 2/), Ca (10/sup 19/ atoms/m/sup 2/) and K (10/sup 19/ atoms/m/sup 2/). Mo, Ni and Cr were also found on tile 1 of the same limiter analysed by Culham Laboratories by means of RBS and other methods.

17436 **(ITEF—145(1985)) Equations of one-dimensional radiative hydrodynamics with thermal conductivity and kinetics of thermonuclear burning.** Basko, M.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1985. 58p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. File Number DE87700748.

Basic equations and formulae permitthing to calculate important physical processes of the controlled thermonuclear fusion with inertial plasma confinement are presented. The formulated equation system is oriented on the target irradiation by heavy ions beams. Equations of two-temperature one-liquid one-dimensional hydrodynamics taking into account the exchange of energy, momentum and mass with fast (epithermal) α particles, neutrons and irradiation field are found. A quasidiffusion approximation describing the energy transport of α particles, neutrons and radiation is formulated. The diffusion equation in a three-temperature approximation is also obtained. Universal formulae for kinetic coefficients (coefficients of absorption of α-particles, neutrons and radiation, coefficients of temperature relaxation and these of electron and ion heat conductivity), true both in cold and hot plasma at high energy concentration, are presented. 34 refs.; 1 fig.

17437 **(KFK—4113) Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells.** Malmberg, T. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Kernfusion). Aug 1986. 111p. NTIS (US Sales Only), PC A06/MF A01. File Number DE87750507.

Within the context of the stability analysis of the cryostat of a fusion reactor the question was raised whether or not the rather lengthy conventional stability analysis can be circumvented by applying a simplified strategy based on common linear Finite Element computer programs. This strategy involves the static linear deformation analysis of the structure with and without imperfections. For some simple stability problems this approach has been shown to be successful. The purpose of this study is to derive a general proof of the validity of this approach for thin shells with arbitrary geometry under hydrostatic pressure or dead loading along the boundary. This general assessment involves two types of analyses: 1) A general stability analysis for thin shells; this is based on a simple nonlinear shell theory and a stability criterion in form of the neutral (indifferent) equilibrium condition. This result is taken as reference solution. 2) A general linear deformation analysis for thin imperfect shells and the definition of a suitable scalar parameter (β-parameter) which should represent the reciprocal of the critical load factor. It is shown that the simplified strategy (=β-parameter approach") generally is not capable to predict the actual critical load factor irrespective whether there is a hydrostatic pressure loading or dead loading along the edge of the shell. This general result is in contrast to the observations made for some simple stability problems. Nevertheless, the results of this study do not exclude the possibility that the simplified strategy will give reasonable approximate solutions at least for a restricted class of stability problems.

17438 **(KFK—4120) Automatic path-planning for a multilink articulated boom within the torus of a fusion reactor.** Smidt, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Aug 1986. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87750503.

For in-torus maintenance of fusion machines a manipulator is conveyed to the working area by a multilink-transporter, also called 'articulated boom'. Systems of this type have in general four to five links and move in the midplane of the torus. They are kinematically redundant and have a very restricted working space. In this paper automatic methods for the collision free approach of any position of the final joint within the reach of the transporter are presented, including insertion and removal. By automatic teach-in with the CAD-simulation a table of safe configurations can be generated and supplemented by a fine-positioning algorithm.

17439 **(LA—10830-C, pp 1-4) Recent progress of S-1 experiments.** Ellis, R. Jr.; Hart, G.W.; Janos, A.; Levinton, F.; Meyerhofer, D.D.; Mimura, M.; Paul, S.; von Goeler, S.; Yamada, M.; Young, P. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC02-76CH03073.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The experimental operation of the S-1 spheromak began in 1983 and the addition of stabilizing coils and improvements in vacuum conditions have since then led to increases in plasma parameters which are described here. Investigations into the scaling of the electron temperature with various parameters and the stabilization of the plasma are discussed. Attainment of the Taylor minimum energy state has been verified. Future plans call for achieving the design plasma current and possibly increasing that value by installation of a transformer along part of the symmetry axis.

17440 (LA—10830-C, pp 5-8) **Internal magnetics of the S-1 Spheromaks.** Hart, G.W.; Janos, A.; Yamada, M.; Young, P.E. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC02-76CH03073.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Of fundamental importance to understanding the physics of Spheromaks is the concept of the Taylor minimum energy state. By examining the structure of the magnetic fields, it is evident that the plasma formed in S-1 does indeed evolve into a Taylor state, in that the ratio of current density to field is a constant in space. This implies that the pressure gradient is zero and that I(psi) is linear. Both of the above effects have been independently verified in these discharges.

17441 (LA—10830-C, pp 9-12) **Global magnetic fluctuations in S-1 spheromak plasmas and relaxation toward a minimum-energy state.** Janos, A.; Hart, G.W.; Yamada, M. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC02-76CH03073.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Globally coherent modes have been observed during formation in the S-1 Spheromak plasma. These modes play an important role in flux conversion and plasma relaxation toward a minimum-energy state. A significant finding is the temporal progression through the n = 5, 4, 3, 2; m = 1 mode sequence as q rises through rational fractions m/n. Peak amplitudes of the modes relative to the unperturbed field are typically less than 5%, while amplitudes as high as 20% have been observed.

17442 (LA—10830-C, pp 13-16) **Methods for examining the particle and energy confinement in S-1.** Meyerhofer, D.D.; Goldston, R.J.; Hart, G.W.; Levinton, F.M.; Mimura, M.; Yamada, M. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Spheromaks are now entering parameter regimes where the study of plasma confinement and transport can be initiated. The purpose of this paper is to discuss some of the methods used in a preliminary examination of the particle and energy confinement in S-1. Various techniques for examining the particle and energy balance in S-1 are discussed with a particular set of discharges used as an example. In the future more experimental data will be taken to understand the particle and energy confinement in the S-1 spheromak. In addition a 1 1/2 D transport code is being written and will be used to enhance their understanding of the spheromak plasma.

17443 (LA—10830-C, pp 17-20) **Measurements of radiated power from the S-1 spheromak.** Paul, S.F.; Meyerhofer, D.D.; von Goeler, S.; Sperduti, A.; Yamada, M. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The S-1 spheromak is a compact toroid whose toroidal and poloidal fields are transferred inductively from a toroidal flux core into the surrounding plasma. In addition to the issues of formation and stability, a primary goal of the S-1 device is to produce a spheromak that is not radiation dominated, so that the transport and confinement properties can be investigated. The plasma parameters which have been used as a guide to roughly identify entry into that regime are temperatures high enough and particle confinement times long enough to ionize most of the low-Z impurities to a helium-like ionization state. It is desired to measure radiative power so that its contribution to the total power balance can be ascertained. This information is used to determine the limits on electron temperature. Measuring the power loss resulting from magnetic effects such as flux conversion and magnetic field fluctuations is also planned. Another purpose of measuring the radiated power is to aid in identifying the relative benefits of impurity reduction techniques such as greater detaching of the poloidal flux from the core, increased stabilization, increased poloidal current, pre-ionization, and improved vacuum conditioning in the form of increased pumping capability and pulsed gas filling. Each of these is believed to have contributed to the increase in the electron temperature. Three experiments have been designed to measure radiated power: (1) a time-resolved emitted power diagnostic (pyroelectric detector); (2) a calibrated time-integrated energy diagnostic (platinum bolometer); (3) a time, space, and energy-resolved radiated power measurement, an ultra-soft X-ray detector array.

17444 (LA—10830-C, pp 21-24) **Summary of electron temperature and density measurements in the S-1 spheromak.** Levinton, F.M.; Hart, G.W.; Meyerhofer, D.D. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC02-76CH03073.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Electron temperature and density measurements have been made in the S-1 spheromak using a movable single point Thomson scattering system and a triple Langmuir probe. The Thomson scattering diagnostic is shown. A 15 Joule ruby laser beam is focused into the plasma at one of several positions along the major radius. Scattered light is collected by a 20 cm lens and imaged onto a fiber optic bundle which transmits the light to an 8 channel polychromator. The signal is digitized and recorded by two LeCroy 2249A ADC's. The first unit is gated at the same time the signal arrives, while the second unit is gated 150 ns later in order to subtract the background light. A triple Langmuir probe has been built to measure the electron temperature and density in S-1 as a function of time. The probe is a double Langmuir probe biased to collect the ion saturation current. The third tip measures the floating potential of the plasma. The voltage difference between the more positive tips and the floating potential is proportional to the electron temperature and from the ion saturation current the electron density is measured. The probe can also be moved to obtain profile information which has been used for particle and energy confinement studies. Data have shown the temperature increases with the total plasma current. Also results from a 0-D model have been consistent with measurements of the electron temperature and density. In the near future they hope to install a multipoint Thomson scattering system. This, in conjunction with additional diagnostic information and a 1 1/2-D transport code under development, will help further progress towards understanding confinement and transport of spheromaks.

17445 (LA—10830-C, pp 25-28) **Initial VUV spectroscopy results from S-1 spheromak.** Mimura, M.; Meyerhofer, D.D.; Paul, S.F.; Young, P. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Recently GISMO[1](Grazing Incidence Spectrograph Monochromator) system was installed on S-1[2] to measure the impurity lines in the VUV region. The main objective of this measurement is to identify the impurity ions in S-1 and evaluate the line radiation loss due to them. Several VUV lines of H, C, D ions were observed in S-1 plasma. An example of the temporal behavior of oxygen ion lines is shown. A method to evaluate the particle confinement time was tried by comparing the time history of the oxygen lines with the calculation of zero dimensional rate equations. The particle confinement time was estimated to be 0.05 msec-0.4 msec.

17446 (LA—10830-C, pp 29-33) **Measurement of the line tying current pattern in the proto S-1/C tilt stabilizing structure.** Wysocki, F.J. (Princeton Univ., NJ). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The Proto S-1/C spheromak device has been used in the past few years to study various tilt stabilization techniques. As the importance of the line tying effect became recognized, a more thor-

ough understanding of the underlying physics was desired. Complex computer modeling of spheromak tilting dynamics using 3-D resistive MHD supported the experimental observations of the effectiveness of line tying, but a true insight into the basic physics is needed. The most recent evolution of the Proto S-1/C stabilizers have allowed easy measurement of the perturbed current pattern during tilting, and the line tying currents have been identified. The experimental patterns are found to be consistent with a proposed simple physical model of line tying, and provide a better understanding of the power and pitfalls of relying on line tying for the enhancement of tilt stabilization.

17447 (LA—10830-C, pp 34-38) **Los Alamos Spheromak Program.** Jarboe, T.R. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The Los Alamos Spheromak has two experimental facilities. The confinement properties of sustained and decaying spheromaks are being studied in CTX. Electrodes for the production of clean sustained spheromaks are being developed on the Electrode Studies Facility.

17448 (LA—10830-C, pp 39-43) **Determination of CTX equilibria.** Knox, S.O.; Barnes, C.W.; Marklin, G.J.; Jarboe, T.R.; Henins, I.; Hoida, H.W.; Wright, B.L. (Los Alamos National Lab., NM). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The method by which they determine the magnetic field equilibrium for CTX in a nonperturbing manner is presented. Measurements of flux conserver image currents are combined with calculations from a numerical model of the equilibrium. Results give equilibria which differ significantly from the minimum energy state, but the equilibria data are well-described by a model where j/B has a linear dependence on the poloidal flux function. The observation of non-disruptive rotating internal kink distortions (with toroidal mode numbers n = 1, 2 and 3) within the equilibria and theoretical MHD thresholds for the onset of these modes corroborate the inferred equilibria.

17449 (LA—10830-C, pp 44-48) **Increased particle confinement with the use of external dc bias field in the CTX spheromak.** Barnes, C.W.; Hoida, H.W.; Henins, I.; Fernandez, J.C.; Jarboe, T.R.; Marklin, G.J. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Spheromaks are formed in a mesh flux conserver in the presence of an external dc bias field. The spheromaks remain stable to tilt instabilities with ratios of bias-to-spheromak flux of up to 47 +/- 7%. Normally applied bias flux puts the spheromak separatrix inside the metal mesh and improves the particle confinement.

17450 (LA—10830-C, pp 49-53) **Local drift parameter, j/n/sub e/ and resistivity anomaly measurements in CTX spheromaks.** Hoida, H.W.; Barnes, C.W.; Henins, I.; Jarboe, T.R.; Buchenauer, C.J.; Marklin, G. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The ratio of the electron drift velocity to the electron thermal velocity (V/sub d//V/sub th/ ~ j/n/sub e/T/sub e//sup 1/2/), also known as the drift parameter (streaming parameter), and j/n/sub e/ (~ V/sub d/) have been measured locally at the magnetic axis in CTX spheromaks at Los Alamos. The drift parameter and j/n/sub e/ appear to be correlated with local measurements of the resistivity anomaly (eta/eta/sub Spitz/) at the magnetic axis. The drift parameter and j/n/sub e/ are varied by changing the background fill pressure. Data is presented for three cases: high density (6-mT fill), medium density (4mT fill) and low density (0mT fill).

17451 (LA—10830-C, pp 54-58) **Generalized helicity and its time derivative.** Jarboe, T.R.; Marklin, G.J. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Spheromaks can be sustained against resistive decay by helicity injection because they tend to obey the minimum energy principle. This principle states that a plasma-laden magnetic configuration will relax to a state of minimum energy subject to the constraint that the magnetic helicity is conserved. Use of helicity as a constraint on the minimization of energy was first proposed by Woltjer in connection with astrophysical phenomena. Use of the helicity constraint was first applied to the spheromak by Wells and Norwood. The principle was later applied to the reversed-field pinch (RFP) by Taylor, who was most responsible for the eventual acceptance and recognition of the principle as being important for RFP-type confinement devices. Of course, helicity does decay on the resistive diffusion time. However, if helicity is created and made to flow continuously into a confinement geometry, these additional linked fluxes can relax and sustain the configuration indefinitely against the resistive decay. In this paper an extension of the definition of helicity to include systems where B can penetrate the boundary and the penetration can be varying in time is presented. The sustainment of RFPs and spheromaks in terms of helicity injection is discussed.

17452 (LA—10830-C, pp 59-62) **Energy efficiency of the CTX magnetized coaxial plasma source.** Fernandez, J.C.; Barnes, C.W.; Jarboe, T.R.; Knox, S.O.; Platts, D.A.; McKenna, K.F. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The energy efficiency of the CTX coaxial plasma source in creating spheromaks is determined experimentally to be in agreement with the theoretical prediction of λ/sub sp//λ/sub g/, where Del x B = λ/sub sp/ B in the spheromak, and λ/sub g/ identical with μ_0I/sub g//phi/sub g/ with I/sub g/ the source current and phi/sub g/ the magnetic flux through either source electrode. This is shown to be equivalent to magnetic helicity conservation. The spheromak impurity radiation was measured using an absolutely calibrated single chord bolometer system. The theoretical efficiency is within the experimental uncertainty of the ratio of spheromak radiated energy to source input energy in a group of dirty discharges. But the radiation measurement uncertainty is too large to determine whether a substantial part of the excess source energy not used in the production of spheromak magnetic energy is radiated from the spheromak volume.

17453 (LA—10830-C, pp 63-67) **Recent helicity source and power supply improvements to CTX.** Henins, I.; Knox, S.O.; Jarboe, T.R.; Barnes, C.W. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Since the last CT Symposium, two major changes in CTX have been the introduction of pulse forming networks (PFNs) to drive the coaxial electrode helicity source, and the very recent installation of a larger source with electrode diameters about twice of the previous ones. The power supplies used for CTX have ranged from the simple connection of the capacitor bank across the electrode collector plates (slow mode) to the more sophisticated PFNs, described here, which optimize the energy transfer from the capacitor bank to the magnetic fields of the spheromak. With the PFNs the formation and sustainment phase (time to peak toroidal plasma current) lasts longer (similarly ordered 0.7 ms) than in the slow mode (similarly ordered 0.05 ms), thus lowering the peak current that must flow through the electrode surfaces. Also, by supplying the source electrodes with both a square pulse current waveform

and a quasi-steady source flux, phi/sub g/, helicity is generated at a constant source λ/sub g/ parameter.

17454 (LA—10830-C, pp 68-72) **Introduction to the m = 1 helicity source.** Platts, D.A.; Jarboe, T.R.; Wright, B.L. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The m = 1 Helicity Source, formerly called the Kinked Z-pinch, was developed as part of the Electrode Studies program at Los Alamos. The Electrode Studies program was initiated to study the control of electrode erosion in long discharge duration spheromak sources. Erosion control is necessary to reduce plasma impurities and to obtain adequate electrode lifetimes. The first task of the Electrode Studies program is to determine, from among a variety of configurations including the coaxial one, a helicity source geometry with good prospects for erosion control. The more efficient the helicity source the easier it will be to control erosion, but the source must also be easy to diagnose and modify if it is to be a useful test bed. The various erosion control techniques which have been proposed will require extensive experimentation to evaluate and optimize. Proposed techniques include, using refractory metals, profiling of the electrodes and magnetic fields, and various gas injection schemes including porous electrodes. It is considered necessary to do these experiments on an optimized helicity source so that the electrode geometries and plasma properties will be relevant. Therefore the present Electrode Studies program is aimed at developing an improved helicity source design.

17455 (LA—10830-C, pp 73-77) **Operation of the m = 1 helicity source.** Wright, B.L.; Jarboe, T.R.; Platts, D.A. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The initial phase of operation of the m = 1 helicity source has been in an asymmetric mode with only a single energized electrode (the second electrode port being fitted with a window). As described in the companion paper, the new source readily forms spheromak plasmas that are equivalent in their parameters to those achieved previously with a coaxial source in the same facility. In this paper they describe the behavior of currents and fields in the m = 1 source and examine the extent to which the basic design principles outlined above apply to its actual operation.

17456 (LA—10830-C, pp 78-81) **Equilibrium of the kink source experiment.** Marklin, G. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The kink source experiment (KSX) was conceived of as a method of injecting helicity into a spheromak making special use of the m = 1 helical Taylor state. It has a Z pinch as a helicity generating source, connected to a flux conserver through an entrance region. Since the entrance region is a long (length > diameter) cylinder, the magnetic field should be close to the helical Taylor state, which is the minimum energy configuration of a magnetized plasma in an infinite cylinder with no net flux. This paper will be concerned with modeling the actual fields in the entrance region of the KSX using zero-beta ideal MHD equilibrium theory.

17457 (LA—10830-C, pp 82-85) **Observation of Doppler shifts and applied magnetic disturbances in PS-3.5.** Antoniades, J.; Peyser, T.; Shaw, R.S.; Chin-Fatt, C.; Goldenbaum, G.C.; Hess, R.A. (Univ. of Maryland, College Park). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Side-on measurements of Doppler shifts of CIII impurity lines have been performed on the PS-3.5 spheromak to determine the spatial and temporal dependence of the ion temperature and flow velocity. Launched magnetic disturbances have been studied in an effort to understand the MHD wave properties of the spheromak.

17458 (LA—10830-C, pp 86-89) **Critical field index for passive coil stabilization of the shift instability.** Goldenbaum, G.C.; Hess, R.A.; Shaw, R.S. (Univ. of Maryland, College Park). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Criteria for the design of stabilization coils for spheromak current distributions are derived. For realistic coils and spherical, force-free plasmas a critical field index is derived above which the coils are ineffective.

17459 (LA—10830-C, pp 90-93) **Current drive by helicity injection in RFP's and spheromaks.** Finn, J.M. (Univ. of Maryland, College Park). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Several methods for driving current in RFP's, tokamaks, and spheromaks by means of helicity injection have been recently proposed. Essential to these ideas is that it is sufficient to replace the helicity that decays due to resistive diffusion, and that the plasma has flux conversion mechanisms, presumably involving 3-D MHD activity, that cause it to relax to a preferred state, conserving the helicity injected. Such a flux conversion or dynamo mechanism has been shown to exist in RFP's, and there is good evidence that it exists in spheromaks. There is also the possibility that tokamaks have such a mechanism; the anomalous skin current penetration has long been linked to double tearing modes. In this paper a few issues regarding the plasma response to these helicity injection schemes are examined. First, it is clear that finite plasma resistivity, at least near the electrodes or gaps, plays an important role; with infinite conductivity the plasma would short out the voltages and preserve its helicity, making injection impossible. Second, flux conversions must occur. For inductively driven systems this is clear because in the absence of relaxations the helicity present after each sinusoidal cycle can only be diminished due to resistive decay. For electrode driven systems such as CTX and MS the helicity injected influences directly only the toroidal field, and generation of poloidal flux must occur via flux conversions. Two important issues are the scaling of current drive efficiency with plasma resistivity, especially near the electrodes or gaps, and the sensitivity of the schemes to the plasma's flux conversion response.

17460 (LA—10830-C, pp 94-97) **Multimode evolution of the decaying spheromak.** Mirin, A.A.; Sgro, A.G. (Lawrence Livermore National Lab., CA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract W-7405-ENG-48.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

MHD simulations of the CTX gun-injected Spheromak at Los Alamos National Laboratory are presented. The simulations have been carried out in toroidal geometry with a three-dimensional, compressible, nonlinear, resistive MHD code.

17461 (LA—10830-C, pp 98-101) **Spontaneous generation of toroidal magnetic field during spheromak formation in a conical Theta-pinch.** Milroy, R.D.; Brackbill, J.U. (Spectra Technology, Inc., Bellevue, WA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Spheromaks have been generated in conical Theta-pinches in a similar manner to FRC generation in straight reversed-field Theta-pinches. The essential difference is that when a conical Theta-pinch coil is used, a toroidal component to the magnetic field

spontaneously appears. The poloidal component is generated by quickly reversing the current in the coil after an initial bias field is embedded in the preionized plasma. The toroidal component is generated through a much more subtle physical process. Numerical calculations have shown that the Hall term can lead to the generation of toroidal magnetic fields during the formation of an FRC; however for a straight coil, symmetry demands equal and opposite fields at each end, so no net toroidal flux or helicity can be generated. A simple analysis shows that even for a conical coil, the Hall term by itself cannot generate significant toroidal magnetic flux or helicity. They will show that a combination of the Hall term with the plasma resistivity can result in toroidal fields of comparable magnitude to experimental observation.

17462 (LA—10830-C, pp 102-105) **Compact torus compression of microwaves.** Hewett, D.W.; Langdon, A.B. (Lawrence Livermore National Lab., CA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract W-7405-ENG-48.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The possibility that a compact torus (CT) might be accelerated to large velocities has been suggested by Hartman and Hammer. If this is feasible one application of these moving CTs might be to compress microwaves. The proposed mechanism, discussed in detail elsewhere, is that a coaxial vacuum region in front of a CT is prefilled with a number of normal electromagnetic modes on which the CT impinges. A crucial assumption of this proposal is that the CT excludes the microwaves and therefore compresses them. Should the microwaves penetrate the CT, compression efficiency is diminished and significant CT heating results. MFE applications in the same parameters regime have found electromagnetic radiation capable of penetrating, heating, and driving currents. A cursory investigation of rf penetration using a 1-D version of a direct implicity PIC code has been made. The study used a much simplified model which takes into account the relevant field orientations but allows gradients only in one spacial direction (axial). Based on a homogeneous linear model, the rf energy might not penetrate if the external omega were larger than the omega/sub 1h/ in the interior. Simulations verify this conjecture. For large amplitudes the leading edge of the CT is significantly eroded. The conclusion is that the CT may be able to compress TE modes if the initial CT peak density initially gives rise to an omega/sub 1h/ < omega - the initial TE mode frequency. These may be strongly dependent on K.B = 0 - a condition that is probably not satisfied in more realistic multidimensional geometries.

17463 (LA—10830-C, pp 106-110) **Experimental and numerical study of various methods of programmed formation on TRX-2.** Slough, J.T.; Milroy, R.D.; Harding, D.G.; Hoffman, A.L. (Spectra Technology, Inc., Bellevue, WA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

It has long been observed that a large fraction of the poloidal flux can be lost from the FRC during the early stages of formation. Following the lead of the Russian experiments at the Kurchatov Institute, various control magnets placed at the ends of the usual theta pinch coil have been used successfully to control much of the formation dynamics and allow for the formation of FRC's with substantially higher levels of poloidal flux. The initial experiments using programmed formation were conducted on TRX-1 and have been continued on TRX-2. The most important aspect of programmed formation is the elimination of the tearing instability that is required in the usual methods of formation. The prepositioning of the separatrix in the preionized plasma at the ends of the theta pinch coil is accomplished by having the plug coil at the end of the magnet assembly produce a field in the direction opposite that of the bias field. It can be seen that as the main field is reversed, an FRC is formed simultaneously with field reversal. Axial magnetic symmetry is maintained since it is programmed by the external coils. This high degree of symmetry allows for the toleration in the subsequent formation of large dynamical axial concentrations that were once believed to be the limiting mechanism in the retention of larger amounts of poloidal flux. Quasi-steady plug coils acting alone are sufficient to avoid an asymmetric tearing reconnection. It was found that the use of another control coil, the trigger coil, located between the main theta pinch coil and the plug coil allowed for an even greater measure of control over the formation dynamics.

17464 (LA—10830-C, pp 111-115) **Design considerations for a large anti s FRC facility.** Hoffman, A.L.; Crawford, E.A.; Milroy, R.D.; Slough, J.T.; Steinhauer, L.C. (Spectra Technology, Inc., Bellevue, WA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The number of internal gyroradii between the field null and the separatrix of field-reversed-configurations (FRC), has been identified as a key parameter governing both stability and transport. Present experiments have anti s in the range of 2, while values of about 30 are thought to be necessary in a reactor. It is thus desirable to conduct experiments in some intermediate range. A value of 10 has been chosen as a reasonable goal for a next experiment. In this paper some of the design considerations and cost optimization procedures used to pick a point design for an anti s = 10 facility are discussed.

17465 (LA—10830-C, pp 116-119) **Flux trapping during field reversal in the formation of a field reversed configuration.** Steinhauer, L.C. (Spectra Technology Inc., Bellevue, WA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC06-80ER53098.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Field reversal is a particularly important phase of field-reversed configuration (FRC) formation because it determines the trapped magnetic flux at liftoff and the average internal magnetic field associated there with (the liftoff field). The plasma heating intrinsic to the FRC formation depends strongly on B/sub LO/ as does the strength of the axial contraction dynamics. Finally, since the plasma is in contact with the wall during field reversal, phenomena during this phase determine the wall heating and the consequent desorption of impurities. A theory of the field-reversal phase is needed which explains the various phenomena in a more transparent and possibly analytical manner. The present paper describes a simple quasianalytic model that is reasonably true to experiment and detailed computations, and can be characterized in terms of simple parameters. The approach is to develop a quasisteady MHD description of the flow. The MHD model is solved which yields information about the instantaneous flow velocity toward the wall and the spatial profiles in the sheath. This then is combined with a simplified circuit model to determine the time-dependent behavior up to liftoff. A related calculation determines the wall heating.

17466 (LA—10830-C, pp 120-123) **Preliminary experimental results with the coaxial slow source.** Pietrzyk, Z.A. (Univ. of Washington, Seattle). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

A Coaxial Slow Source was constructed to generate a Field Reversed configuration (FRC) on a slow (slower than Alfve'n transit time) time scale. The machine consists of a regular FRC configuration, with an additional Theta coil in the center supplying reversed flux from the inside of this inner coil. With this source successful generation of field reversal configuration has been achieved over a wide range of parameters. Termination occurs either by inner wall contact, arising from decay of inner coil current coupled with high resistivity, due to impurities, or by some form of MHD instabilities. Near term plans include modification of inner coil circuit, and improved impurity control measures.

17467 (LA—10830-C, pp 124-127) **Quasistatic modelling of the coaxial slow source.** Hahn, K.D.; Pietrzyk, Z.A.; Vlases, G.C. (Univ. of Washington, Seattle). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

A new 1-D Lagrangian MHD numerical code in flux coordinates has been developed for the Coaxial Slow Source (CSS) geometry. It utilizes the quasistatic approximation so that the plasma evolves as a succession of equilibria. The P=P (psi) equilibrium constraint, along with the assumption of infinitely fast axial temperature relaxation on closed field lines, is incorporated. An axially elongated, rectangular plasma is assumed. The axial length is adjusted by the global average $<\beta>$ condition, or assumed to be fixed. In this paper predictions obtained with the code, and a limited amount of comparison with experimental data are presented.

17468 (LA—10830-C, pp 128-131) **FRC plasma transport studies with 1-D plus modified Hill's vortex radial profiles.** Shieh, D.R.; York, T.M. (Pennsylvania State Univ., University Park). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

A time dependent one-dimensional-plus (z-direction plus defined radial profiles) fluid model which includes plasma both inside and outside the separatrix (two regions) has been developed. The 1-D computer model has been used with success to model the FRX-B experiment. From the comparisons of eight different cases, it is concluded that: (1) radial gradient length expands very slowly (C/sub d/ = 0.25) or keeps the same in time, rather than expands fast (C/sub d/ = 1) or shrinks (T.F.L.), (2) particle and T/sub e/ radical loss is dominated by the LHD anomalous transport theory, (3) axial heat conduction is dominated by cross field rather than along field conduction, (4) with eta/sub phi/ = 4.05 eta/sub cl/, the poloidal flux diffusion time, tau/sub phi/, is 48 μsec for case A. For plasma outside, sidewall interaction and added guide coil affect the plasma behavior locally; however, the upstream influence on the plasma inside is very small.

17469 (LA—10830-C, pp 132-136) **Recent FRC translation experiments on FRX-C/T.** Rej, D.J.; Armstrong, W.T.; Chrien, R.E.; Hugrass, W.N.; Klingner, P.L.; McKenna, K.F.; Sherwood, E.G.; Siemon, R.E.; Tuszewski, M. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Since the last CT Symposium, several accomplishments have been realized from the FRC translation studies on the FRX-C/T device: (1) FRCs have been launched into, and trapped in, a dc magnetic guide field region without the use of any pulsed gate coils; (2) detailed studies of translation dynamics have been performed which are consistent with energy conservation, adiabatic compression theory, and 2-D MHD simulations; (3) the confinement properties of translated FRC has been evaluated; (4) translation through either puff or static deuterium gas fill has been demonstrated; (5) higher density ($n \leqq 4 \times 10^{15}$ cm^{-3}) FRCs have been translated over 10-m lengths; (6) the n = 2 rotational instability has been stabilized by FRC translation into a weak helical quadrupole field.

17470 (LA—10830-C, pp 137-141) **FRC formation studies on FRX-C with Z-discharge ionization.** Armstrong, W.T.; Chrien, R.E.; Hugrass, W.; Klingner, P.L.; McKenna, K.F.; Milroy, R.D.; Rej, D.J.; Sherwood, E.G.; Siemon, R.E.; Tuszewski, M. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Recent operation at high-bias levels on FRX-C is discussed in this paper. The motivation of these in situ formation studies was to explore the use of Z-discharge pre-ionization (Z-PI) for achieving larger trapped poloidal flux and commensurately large x/sub s/ values, where x/sub s/ is the ratio of the separatrix radius r/sub s/ to the coil radius r/sub c/. Such studies are of interest in testing predicted improvements of particle confinement and degradation of stability with the associated increase of anti s, the approximate number of ion gyroradii across the minor radius of the FRC. The results of these studies may be summarized briefly as: (1) the Z-PI worked well in conjunction with conventional theta-PI to extend the level of trapped flux at high fill pressure (20 mtorr), but the Z-PI worked poorly at low fill pressure (5 mtorr), and (2) increased trapped flux at 5 mtorr quickly led to degradation of the flux lifetime and no significant increase in x/sub s/, while at 20 mtorr the initial value of x/sub s was increased significantly but with degraded flux lifetimes. These studies indicate that increased closed flux thru changes in PI techniques is insufficient by itself to form long-lived, large-radius FRCs in the present FRX-C configuration.

17471 (LA—10830-C, pp 142-146) **Axial dynamics in field-reversed theta-pinches.** Tuszewski, M. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

This paper is concerned with the final phase during formation of field-reversed configurations (FRC): the axial dynamics. Strictly speaking, this study only applies to field-reversed theta-pinches for which spontaneous reconnection occurs. In early FRC work on such devices, a rapid disappearance of the trapped flux associated with axial contraction was already noted. At Los Alamos, axial dynamics was sometimes observed on FRX-A, virtually never noticed on FRX-B[3] even with bias fields B/sub b/ > 3 kG, but found recently to seriously limit the flux trapping in FRX-C. Poor FRC confinement was consistently found in that device whenever B/sub b/ exceeded a certain value B/sub bM/ of about 0.8 kG and 1.6 kG for 5 and 20 mtorr cases, respectively. This phenomenon remained unexplained as FRC confinement and translation studies were undertaken with B/sub b/ $\leqq$ B/sub bM/. In the context of a preliminary FRX-D study, Steinhauer's formation model was used. When applied to the existing FRX-C data, this model indicated a rather sudden transition from weak to strong axial shocks for B/sub b/ ~ B/sub bM/, which suggested that axial dynamics might be responsible for the poor FRC confinement observed for B/sub b/ $\geqq$ B/sub bM/. This was recently confirmed by in situ experiments on FRX-C/T. These data are reported and discussed here.

17472 (LA—10830-C, pp 147-151) **FRC translation into a compression coil.** Chrien, R.E. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The equilibrium and translational kinematics of Field-Reversed Configurations (FRCs) in a cylindrical coil which does not conserve flux are problems that arise in connection with adiabatic compressional heating. In this paper, they consider several features of the problem of FRC translation into a compression coil. First, the magnitude of the guide field is calculated and found to exceed that which would be applied to a flux conserver. Second, energy conservation is applied to FRC translation from a flux conserver into a compression coil. It is found that a significant temperature decrease is required for translation to be energetically possible. The temperature change depends on the external inductance in the compression circuit. An analogous case is that of a compression region composed of a compound magnet; in this case the temperature change depends on the ratio of inner and outer coil radii. Finally, the kinematics of intermediate translation states are calculated using an abrupt transition model. It is found, in this model, that the FRC must overcome a potential hill during translation, which requires a small initial velocity.

17473 (LA—10830-C, pp 152-154) **FRX-C/T large source modification.** Tuszewski, M.; Chrien, R.E.; Yavornik, E.J.; Armstrong, W.T.; Hugrass, W.; Linford, R.K.; McKenna, K.F.; Rej, D.J.; Siemon, R.E. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

FRC experiments on FRX-C/T during the past two years have been devoted to translation studies and, more recently, to formation studies in situ. The interest in the latter became stronger as FRX-D was proposed. It is intended that, in summer 1985, FRX-C/T be modified with a larger coil that would be essentially a half-scale prototype of FRX-D. This would allow studies of flux trapping with increased size and with the associated enhanced axial dynamics. The results from these formation studies, with and without some improved formation techniques, may influence the design of the FRX-D source in a major way. In addition, this FRX-C/T Large Source Modification may allow the study of FRC's with somewhat increased values of anti s, in the range 2-3. This may be sufficient to reach a new stability regime where the predicted internal tilt mode may occur. Finally, the larger coil size should yield improved FRC confinement times by about 50%, and may allow with a minimum of plasma decompression the study of FRC's with x/sub s/ in the range 0.6-0.7 in possible future translation experiments.

17474 (LA—10830-C, pp 155-158) **Proposed FRX-D experiment.** McKenna, K.F.; Armstrong, W.T.; Chrien, R.E.; Hugrass, W.N.; Linford, R.K.; Rej, D.J.; Schwarzmeier, J.L.; Siemon, R.E.; Tuszewski, M. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The field-reversed-configuration (FRC) research program is poised for a significant step forward. Resolution of the critical FRC physics issues, which must now be addressed in order to advance the development of this concept, requires experimental studies in a plasma regime closer to reactor relevance than is possible with existing devices. The purpose of FRX-D is to extrapolate the parameters of FRC's into the required regime of large plasma size relative to an ion gyroradius i.e., large anti s. The critical issues that FRX-D will address are: (1) the FRC stability and confinement properties at large anti s; (2) the demonstration of adiabatic compression as an efficient, technologically attractive FRC heating method; (3) the identification of the dominant electron energy-loss mechanism, and; (4) the determination of the dependence of poloidal flux loss on electron temperature. An additional, more technologically oriented purpose of FRX-D is to demonstrate the separation of FRC formation and heating functions using the reactor-like technique of sequential formation/translation/compression.

17475 (LA—10830-C, pp 159-163) **Recent results of an internal tilt mode calculation in FRCs.** Barnes, D.C.; Schwarzmeier, J.L.; Lewis, H.R. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Recent theoretical results on the stability of FRCs to the internal tilt mode are presented. An approximate treatment of collisions shows that collisions have a small effect on the growth rate of the mode until the plasma becomes very collisional (λ/sub ii/ ≦ r/sub s//2). Finite Larmor radius theory predicts that the growth rate of the instability normalized to that of MHD depends only on the combination anti s/e, where e is the plasma elongation. However, a full Vlasov stability calculation does not appear to show such a scaling.

17476 (LA—10830-C, pp 164-167) **Plasma resistivity near null magnetic field region in FRC.** Hamasaki, S.; Krall, N.A.; Sperling, J.L. (JAYCOR, San Diego, CA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

One persistent mystery during the stable confinement period in FRC experiments is the rate of magnetic flux loss. The particle confinement time is consistent with theoretical modelings based on the lower-hybrid-drift instability, but the flux decay is much faster than the theoretical predictions. Flux decay is proportional to the resistivity at the plasma center, where the lower-hybrid-drift mode is predicted to be stable, and classical resistivity is too small to explain the magnetic flux confinement time. In this paper they consider several processes which affect flux decay.

17477 (LA—10830-C, pp 168-171) **Transport simulation of a field-reversed configuration plasma.** Shumaker, D.E. Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract W-7405-ENG-48.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

This paper presents a comparison of a 1 1/2-D transport simulation of a FRC, field-reversed configuration, with experimental results. The plasma consist of two regions one which has open field lines and the other which has closed field lines. The simulation code computes the evolution of the plasma by alternating between the solution of a 2-D equilibrium and the simultaneous solution of three 1-D transport equations. The plasma is modeled as evolving through a sequence of axisymmetric equilibria. A property of these equilibria is that some quantities are 1-D function of the flux surface label. This makes it possible to obtain 1-D transport equations for these flux surface quantities. The transport equations advance the particle count, electron entropy and ion entropy. These are adisbatic quantities. They are used because there transport equations are independent of the flux surface velocity. This reduces the coupling between the equilibrium calculation and the transport calculation. This paper presents a comparison of the various confinement times obtained from the simulation with the experimentally measured values. There are three confinement times which are compared; particle confinement time, tau/sub N/, energy confinement time, tau/sub E/, and poloidal magnetic flux confinement time, tau/sub phi/. These confinement times are compared to confinement time for the FRX-C experiment at Los Alamos.

17478 (LA—10830-C, pp 172-175) **Mode beating model of ac helicity injection.** Bellan, P.M. (California Institute of Technology, Pasadena). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Ac helicity injection (F-Theta pumping) was previously proposed to consist of two stages: (1) quasi-classical stage where the velocity perturbation of a compressional A lfven mode and the magnetic field perturbation of a resistive diffusion mode beat to provide a dc surface current and (2) an anomalous stage where this dc current penetrates to the plasma core via tearing or magnetic turbulence. This paper will discuss some additional features of ac helicity injection using these concepts.

17479 (LA—10830-C, pp 176-178) **Generalization of the Taylor Principle.** Jensen, T.H. (GA Technologies Inc., San Diego, CA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

The usual Taylor Principle can in general only be applied when the system is closed. This paper describes a suggestion of a generalization to cover the case that the plasma is surrounded by a conducting shell with narrow gaps where the external circuits connected to the gaps consist of just inductors. The suggested constraint of the generalized Taylor Principle is that no helicity is absorbed by the plasma. The usual assumption that the stable Taylor Equilibrium is that for which the magnetic energy in the plasma region as well as in the external inductors is minimized subject to the above constraint, again leads to a unique configuration. It is

found that this configuration is dependent upon the inductances of the external inductors. For the sake of conceptual simplicity, consider a closed shell of conducting material. The interior of the shell may be divided into various compartments only corrected through narrow gaps in the conducting walls between these compartments. They assume plasma present in only one of the compartments; the neighboring compartments represent the external inductors connected across the gaps of the plasma compartment.

17480 (LA—10830-C, pp 187-190) **Ion ring experiments with applications to the compact toroid program.** Schamiloglu, E.; Greenly, J.B.; Hammer, D.A.; Pedrow, P.D.; Sudan, R.N. (Cornell Univ., Ithaca, NY). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract AC02-77ET53005.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

There has been considerable progress recently in the Cornell ion ring experimental program towards developing the technology and understanding for injecting large orbit energetic ions into a compact toroid plasma. The merits of such a CT-Hybrid have been discussed elsewhere, but it is worthwhile to emphasize that energetic ions serve to (i) heat the CT plasma and (ii) provide stabilization against several disruptive macroscopic modes. The two experiments in progress are IREX and LONGSHOT II. The IREX experiment is studying trapped, weakly diamagnetic proton rings in a magnetic mirror field. The goal of the IREX experiment is to trap and magnetically compress strong proton rings. The LONGSHOT II experiment is studying the propagation of weakly diamagnetic proton rings in a preionized hydrogen plasma. In addition, the LONGSHOT II injector is being used for the development of kilojoule pulsed proton sources capable of repetitive pulse operation. The goal of the LONGSHOT II experiment is to merge a proton ring with a CT plasma.

17481 (LA—10830-C, pp 191-195) **Injection and trapping of intense neutralized ion beams in closed magnetic configuration.** Katzenstein, J.; Li, R.; Rostoker, N. (Univ. of California, Irvine). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—).

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

It has been demonstrated by calculation and verified by experiment that a neutralized ion beam may be injected across magnetic field lines, that the beam will penetrate a plasma confined by the field and be trapped. The combined processes of injection, penetration, and confinement of the beam requires the satisfaction of three conditions outlined here. In this paper the question of single particle confinement of the beam is addressed with particular reference to UCI Tokamak and text.

17482 (LA—10830-C, pp 196-199) **Acceleration of compact torus plasma rings in a coaxial rail-gun.** Hartman, C.W.; Hammer, J.H.; Eddleman, J. (Lawrence Livermore National Lab., CA). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract W-7405-ENG-48.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

They discuss here theoretical studies of magnetic acceleration of Compact Torus plasma rings in a coaxial, rail-gun accelerator. The rings are formed using a magnetized coaxial plasma gun and are accelerated by injection of B/sub Theta/ flux from an accelerator bank. After acceleration, the rings enter a focusing cone where the ring is decelerated and reduced in radius. As the ring radius decreases, the ring magnetic energy increases until it equals the entering kinetic energy and the ring stagnates. Scaling laws and numerical calculations of acceleration using a O-D numerical code are presented. 2-D, MHD simulations are shown which demonstrate ring formation, acceleration, and focusing. Finally, 3-D calculations are discussed which determine the ideal MHD stability of the accelerated ring.

17483 (LA—10830-C, pp 200-203) **Energy confinement in a high-current reversed field pinch.** An, Z.G.; Lee, G.S.; Diamond, P.H. (Univ. of Texas, Austin). Sep 1986. NTIS, PC A10/MF A01. File Number DE87003801. (CONF-8505100—). Contract FG05-80ET53088.

From 7. symposium on the physics and technology of compact toroids in the magnetic fusion energy program; Santa Fe, NM, USA (21 May 1985).

Ion temperature gradients drive instabilities which are strong candidates for the cause of confinement degradation in high current RFP's. This paper investigates coupled resistive interchange-ion temperature gradient modes via a model based on two-fluid theory. Results show that ion modes can be a major channel for thermal losses and suggest that pellet injection is a potentially viable mechanism for improving energy confinement.

17484 (LA-UR—86-3705) **Requirements for charged-particle reaction cross sections in the d-d, d-t, t-t, and d-^{3}He fuel cycles.** Jarmie, N. (Los Alamos National Lab., NM (USA)). Dec 1986. Contract W-7405-ENG-36. 14p. (CONF-861250—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002929.

From IAEA advisory group meeting on nuclear data for fusion reactor technology; Dresden, German D.R. (1 Dec 1986).

This paper reviews the status of experimental data and data evaluations for charged-particle reactions of interest in fusion-reactor design. In particular, the ^{3}H(t,α)n, ^{2}H(d,p)^{3}H, ^{2}H(d,^{3}He)n, ^{3}H(t,α)nn and ^{3}He(d,p)^{4}He reactions at low energies are studied. Other secondary reactions are considered. The conclusion is that such cross sections are well known for the near and medium term, and that no crucial experimental lack exists. There is a serious lack of standard evaluations of these reactions, which should be in an internationally acceptable format and easily accessible. Support for generating such evaluations should be given serious consideration.

17485 (NIIEFA-P-K—0687) **High-voltage cable lead-in for pulse techniques.** Arsent'ev, V.N.; Vasilevskij, M.A.; Grad, G.A.; Finkel'shtejn, K.I. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1985. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700846.

Problems of projection of high-voltage cable lead-ins used in particular in electroionization lasers with separately standing pulsed supply source are considered in the paper. It is shown that uniform voltage division along lead-in surface can be provided by means of electrolyte filling gaps between cable termination and bushing insulator. Results of voltage distribution calculation along lead-in surface depending on electrolyte column resistance and voltage pulse duration are given. It is noted that use of cable lead-ins with ohmic voltage divider decreases overvoltage level appearing during impedance mismatch of pulse voltage generator and discharge gap resistance. 6 refs.; 7 figs.

17486 (ORNL/FEDC—85/10) **Liquid nitrogen cooling considerations of the Compact Ignition Tokamak.** Dabiri, A.E. (Oak Ridge National Lab., TN (USA)). Oct 1986. Contract AC05-84OR21400. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005278.

A simple model was developed to estimate the cooldown time between pulses of toroidal field (TF) coils of the Compact Ignition Tokamak (CIT) using liquid nitrogen. Good agreement was obtained between the analysis results and those measured in the early fusion experimental devices. A cooldown time of about 1 h would reduce the TF coil temperature to about 80 K. An R and D experimental program is required to determine the actual cooldown time between pulses, an issue in the conceptual design of the CIT.

17487 (SAND—86-1382C) **Intense lithium ion beam diagnostic using the inverse nuclear reactor D(^{7}Li,n)^{8}Be.** Leeper, R.J.; Kim, K.H.; Hebron, D.E.; Wing, N.D.; Norbeck, E. (Sandia National Labs., Albuquerque, NM (USA); Iowa Univ., Iowa City (USA)). Nov 1986. Contract AC04-76DP00789. 11p. (CONF-861114—38). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004521.

From 9. international conference on application of accelerators in research and industry; Denton, TX, USA (10 Nov 1986).

The decision to employ high voltage lithium ion beams on the 100 TW PBFA-II accelerator has prompted the investigation of using the inverse nuclear reaction $D(^7Li,n)^8Be$ as an intense beam diagnostic. The diagnostic scheme operates by utilizing the high energy neutrons that are emitted from the $D(^7Li,n)^8Be$ reaction when a ^7Li beam is incident upon a target containing deuterons. These high energy neutrons can in turn induce the $^{63}Cu(n,2n)^{62}Cu(\beta^+)$ reaction. The amount of 9.74 min ^{62}Cu activity formed can then be measured and related to the total number of ^7Li in the beam. The results of calibration runs using ^7Li beams accelerated to energies from 1 to 32 MeV are summarized.

17488 **(UCRL—52000-86-11) Energy and Technology Review, November 1986.** Cabayan, H.S.; Kozman, T.A.; Clements, W.; de Vore, L.; Gerich, C.; Hendry, D.P.; O'Neal, E.M. (eds.). (Lawrence Livermore National Lab., CA (USA)). Nov 1986. Contract W-7405-ENG-48. 71p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005196.

An interview with Ken Fowler, LLNL's Associate Director for Magnetic Fusion Energy, is presented. Dr. Fowler describes the present state of fusion research at LLNL and comments on future directions for the program. Also included are the following: (1) evolution of the tandem-mirror approach to magnetic fusion, (2) MFTF-B, (3) overview of plant and equipment tests, (4) PACE tests: the magnet system, (5) PACE tests: the cryogenic system, (6) PACE tests: the neutral beam heating system, (7) PACE tests: the ecr heating system, (8) PACE tests: the plasma diagnostics system, and (9) PACE tests: the integrated control system. (MOW)

17489 **(UCRL—95588) The operator interface for the Mirror Fusion Test Facility.** Lang, N.C. (Lawrence Livermore National Lab., CA (USA)). Dec 1986. Contract W-7405-ENG-48. 35p. (CONF-861244—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87002755.

From ACM SIGCHI workshop on mixed modes of interaction; Key West, FL, USA (15 Dec 1986).

The uncertain and most likely changing nature of a large experimental facility like MFTF, as well as its large number of control and monitor points, ruled against the traditional hardware approach involving walls of knobs, dials, oscilloscopes, and strip chart recorders. Rather, from the beginning, project management specified computer control of all systems, and operation of the complete MFTF under an integrated computer control system became a major engineering goal. The Integrated Controls and Diagnostics (ICADS) group was charged with the design and implementation of this control system. We designed a control system with an extremely flexible operator interface which uses computer generated CRT displays for output and pointing devices such as touch sensitive CRT overlays, mice, and joysticks for input. Construction of MFTF was completed at the end of 1985 within the project budget of $241.6M and was followed immediately by a 5 month long acceptance test. During this period (known as PACE test) operators, engineers, and physicists successfully used our computer control system daily to test MFTF. Much of their willingness to forsake the traditional hands-on hardware approach to testing was a result of the powerful and flexible operator interface to the MFTF control system. In this paper, we describe the operator interface with emphasis on the displays, the touch screens, and the mouse. We also report the experiences of users and, in particular, stress those aspects of the user interface they strongly liked and disliked.

17490 **(UTNL-R—0176) Proceedings of study meeting on nuclear fission-nuclear fusion hybrid reactors.** (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.). May 1985. 43p. (In Japanese). (CONF-8501104—Summs.). NTIS (US Sales Only), PC A03/MF A01. File Number DE87701240.

From Study meeting on nuclear fission-nuclear fusion hybrid reactor; Tokai, Ibaraki, Japan (11 Jan 1985).

This study meeting was held on January 11, 1985, at the Nuclear Engineering Research Laboratory, University of Tokyo. Lectures were carried out on the outline of hybrid reactors and the one-dimensional transport burning computation code BISON, the neutronics experiment using depleted uranium blocks, the safety of hybrid reactors, electric power-producing hybrid reactors and their safety analysis (balanced concentration type blankets, the dynamic characteristics of DT tokamak hybrid reactors, fuel production type hybrid reactors) UO/sub 2/ powder direct enrichment type, and the development of nuclear fusion reactors and the significance of hybrid reactors. The summaries of these lectures are collected in this report. (Kako, I.).

17491 **Multishell inertial confinement fusion target.** Holland, J.R.; Del Vecchio, R.M. (to Dept. of Energy, Washington, DC). US Patent 4,634,567. 6 Jan 1987. Filed date 10 Aug 1983. vp.

This patent describes a multishell inertial confinement fusion target, comprising: a preformed fuel pellet; a hollow shell surrounding the fuel pellet and having an inner surface spaced from an outer surface of the fuel pellet, the shell comprising an inner layer of self-supporting material and an outer coating; and a pair of substantially parallel taut open nets stretched across the shell and secured to the inner layer of the shell at a number of spaced locations around the inner surface thereof and along a plane cutting the shell parallel to an equator of the shell and spaced therefrom. The pair of taut open nets are in spaced relationship with respect to one another and with respect to the equator of the shell and located on opposite sides of the equator. The pair of taut open nets form an open center pocket therebetween for engaging opposing portions of the outer surface of the fuel pellet to maintain the fuel pellet in a substantially concentric position relative to the inner surface of the shell; each of the taut open nets consisting of a network of intersecting fibers, each of the fibers being stretched across the shell with ends thereof being scured to the inner layer of the shell along the plane. The fibers each have a length less than a diameter across the equator of the shell so as to form the open central pocket for engaging the opposing portions of the outer surface of the fuel pellet.

17492 **Physics guidelines for the Compact Ignition Tokamak.** Sheffield, J.; Dory, R.A.; Houlberg, W.A.; Uckan, N.A.; Bell, M.; Colestock, P.; Hosea, J.; Kaye, S.; Petravic, M.; Post, D. (Oak Ridge National Lab., P.O. Box Y, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 481-490(Nov 1986). (CONF-860652—). Contract AC05-84OR21400.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The goal of the Compact Ignition Tokamak (CIT) program is to provide a cost-effective route to the production of a burning deuterium-tritium plasma, so that alpha-particle effects may be studied. A key issue to be studied in the CIT is whether alpha power behaves like other power sources in affecting tokamak plasma confinement. The program is managed by the Princeton Plasma Physics Laboratory and includes broad community involvement. Guidelines for the preliminary design effort have been provided by the Ignition Technical Oversight Committee in discussion with the tokamak community. The reference design is a tokamak with a high field (10 T), high current (10 MA), a poloidal divertor, and liquid-nitrogen-cooled coils. It is a small, high-power-density device of the type proposed by Bruno Coppi (MIT). It has a major radius of 1.23 m, a minor radius of 0.43 m, and a plasma ellipticity of 1.8. This paper reviews the aims of the program and the basis for the physics guidelines. The role of the CIT in the longer-term tokamak program is briefly discussed.

17493 **Overview of the Compact Ignition Tokamak.** Flanagan, C.A.; Brown, T.G.; Hamilton, W.R.; Lee, V.D.; Peng, Y.K.M.; Shannon, T.E.; Spampinato, P.T.; Yugo, J.J. (Fusion Engineering Design Center, P.O. Box Y, FEDC Building, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 491-497(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Compact Ignition Tokamak (CIT) mission is to achieve ignition and provide the capability to experimentally study burning plasma behavior. A national team has developed a baseline concept including definition of the necessary research and development. The baseline concept satisfies the physics performance objectives established for the project and complies with defined design specifications. To ensure that the mission is achieved, the design requires large magnetic fields on axis (— 10 T) and use of large plasma cur-

rents (— 10 MA). The design is capable of accommodating significant auxiliary heating to enter the ignited regime. The CIT is designed to operate in plasma parameter regimes that a are directly relevant to future fusion power reactors.

17494 **Configuration development and structural assessment of the FEDC Ignitor concept.** Brown, T.G.; Lee, V.D.; Mayhall, J.A. (Fusion Engineering Design Center, P.O. Box Y, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 508-513(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Fusion Engineering Design Center (FEDC) performed a design study for a compact ignition tokamak based on the design approach established by Professor Bruno Coppi of the Massachusetts Institute of Technology in his Ignitor concept. His Ignitor concept has two unique features. First, the throat of the copper plate toroidal field (TF) coils is preloaded in the vertical direction to minimize the stress levels in the copper. Second, the net inward radial TF coil forces are balanced by a combination of wedging on the adjacent faces of the TF coils and by bucking against the ohmic heating solenoid coils in the bore of the tokamak. Later Ignitor concepts eliminated the wedging reactions. Both of these features inherently reduce the radial build of the tokamak device. The FEDC version of Ignitor incorporates both of these unique features packaged in a different configurational arrangement. The FEDC Ignitor features a totally external preload system. The preload is applied directly to the inner leg of the TF coils in the vertical direction only. Horizontal rings are utilized only to react inplane TF coil forces and are not part of the preload system. Modular quadrants of TF coil encasements are utilized to vastly simplify device assembly methods. This design allows the entire core assembly to be constructed in a manufacturing facility and shipped to the site. The improved configuration also results in larger access ports direly needed for diagnostics and radio frequency heating units which may be required. This paper presents the configuration and a structural assessment of the FEDC Ignitor concept.

17495 **International Tokamak Reactor (INTOR).** Stacey, W.M. Jr. (Georgia Institute of Technology, Atlanta, GA 30332). *Fusion Technology;* **10**: No. 3, 704-708(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The current INTOR design concept and the ongoing work in the INTOR Workshop are reviewed. The ongoing work includes evaluation of innovations that could substantially improve tokamak reactors, analysis of critical technical issues that affect the feasibility of the INTOR design concept and revision of the INTOR conceptual design.

17496 **Tokamak power systems studies at ANL.** Baker, C.C.; Ehst, D.A.; Brooks, J.N.; Evans, K. Jr. (Argonne National Lab., 9700 South Cass Avenue, Bldg. 205, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 709-718(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A number of advances in plasma physics and engineering promise to greatly improve the reactor prospects of tokamaks. The following features, in particular, are examined: (a) large aspect ratio ($A \approx 6$), which may ease maintenance; (b) high beta ($\beta \geq 0.20$) without indentation, which brings the maximum toroidal field down to about 7 T; (c) low toroidal current ($I \approx 5MA$), which reduces the cost of the current drive and equilibrium field system; and (d) steady state operation with current density control via fast and slow wave current drive. The key to high beta operation with low toroidal current lies in utilizing second stability regime equilibria with the required current distributions produced by an appropriate selection of wave driver frequencies and power spectra. The ray tracing and current drive calculation is self-consistent with the actual magnetic fields produced in the plasma. In addition to matching desirable high-beta equilibria, this method is capable of producing a large variety of new equilibria, many of which look attractive. The impurity control activities in TPSS have emphasized the self-pumping concept as applied to using the entire first wall or "slot" limiters. The blanket design effort has emphasized liquid metal and Flibe concepts. The reference concept is a liquid lithium/vanadium, self-cooled configuration. Overall, there exists a number of major design improvements which will substantially improve the attractiveness of tokamak reactors.

17497 **IPFR, Integrated Pool Fusion Reactor Concept.** Sze, D.K. (Argonne National Lab., 9700 South Cass Avenue, FPP-205, Argonne, IL 60439-4837). *Fusion Technology;* **10**: No. 3, 875-880(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The IPFR (Integrated Pool Fusion Reactor) concept involves placing a fusion reactor into a pool of molten Flibe. The Flibe serves the multiple functions of breeding, cooling, shielding, and moderating. Therefore, the only structural material between the superconducting magnets and the plasma is the first wall. The first wall is a stand-alone structure with no coolant connection and is cooled by Flibe at atmospheric pressure. There is also no need for a primary coolant loop. The design is expected to improve the safety, reliability, and maintainability aspects of the fusion system.

17498 **Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor.** Duggan, W.P.; Steiner, D.; Embrechts, M.J. (Dept. of Nuclear Engineering, Rensselaer Polytechnic Institute, Troy, NY). *Fusion Technology;* **10**: No. 3, 890-895(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A design of a compact fusion reactor is proposed based on the reversed field pinch and utilizing the "Integrated-Blanket-Coil" (IBC) concept. The IBC is applied to the toroidal field and divertor systems, with liquid metal used for cooling both the first wall and blanket. This simplifies the overall design by requiring only a single coolant cycle. In addition, safety is increased by eliminating any possible lithium-water interaction in the fusion power core. Finally, replacing conventional copper divertor coils with IBC components enhances tritium breeding and energy recovery. A generic problem with liquid metal coolants is their reduced heat transfer capabilities in magnetic fields. In this context, the use of liquid metal coolants may limit the allowable neutron wall loading to a value of 10 MW/m/sup 2/. Above this value it may be necessary to use water cooling for the first wall and divertor surfaces.

17499 **TIBER II-An upgraded tokamak ignition/burn experimental reactor.** Henning, C.D.; Logan, B.G.; Perkins, L.J.; Barr, W.L.; Bulmer, R.H.; Devoto, R.S.; Doggett, J.N.; Johnston, B.M.; Lee, J.D.; Miller, J.R. (Lawrence Livermore National Lab., Univ. of California, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1079-1087(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors are designing a minimum-size Tokamak Ignition/Burn Reactor (TIBER II). This design incorporates physics requirements, neutron wall loading and fluence parameters that will make it compatible with a nuclear testing mission. Reactor relevant physics will be tested by using current drive and steady-state operation. Although the design accommodates several current drive options, including neutral beams, the base case uses a combination of lower hybrid and electron-cyclotron radio frequency power. Minium neutron shielding, compact structures, high magnet-current densities, and remotely maintainable vacuum seals, all contribute to the compact size.

17500 **Compact fusion engineering research facility based upon the LITE concept.** Wagner, C.E.; Berwald, D.; Listvinsky, G. (TRW, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 1117-1122(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors present a Fusion Engineering Research Facility Design based upon the Long Pulse Test Experiment (LITE) Concept. This design features component upgrades of the LITE design to allow long pulse, high fluence operation, and to proviae access

for engineering test ports. This facility could perform an engineering mission nearly as ambitious as INTOR at less than half the projected life-cycle operating costs.

17501 **The final version of MINIMARS--An engineering view.** Nelson, W.D.; Lousteau, D.C.; Doggett, J.N. (Fusion Engineering Design Center, P.O. Box Y, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 1146-1152(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A two year study to describe an attractive tandem mirror reactor has recently been completed. The reactor, called MINIMARS, has met all its mission goals. For instance, it will produce 600 MW of net electrical power at a cost of less than 50 mill/kWh. It has a mass utilization of 100 kW/tonne. In the event of a major accident, the MINIMARS reactor will minimize the risk of a major loss in investment and will be passively safe. The first year of the study emphasized innovative concepts and trade studies that led to good cost vs performance. The second year of the study developed the proposed concepts into an integrated point design. This paper presents a description of the MINIMARS design and its related cost. The engineering integration of this machine has been a principal activity at the Fusion Engineering Design Center (FEDC).

17502 **Advanced tokamak reactors based on the spherical torus (ATR/ST).** Miller, R.L.; Krakowski, R.A.; Bathke, C.G.; Copenhaver, C.; Schnurr, N.M.; Engelhardt, A.G.; Seed, T.J.; Zubrin, R.M. (Los Alamos National Lab., Los Alamos, NM 87544). *Fusion Technology;* **10**: No. 3, 1153-1158(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Results of a preliminary conceptual design of a magnetic fusion reactor based on the spherical torus (tokamak), characterized by high first-stability-regime beta values at low aspect ratio and moderate vertical elongation of the plasma, are described. The concept incorporates resistive (demountable) toroidal-field coils, a double-null poloidal-field magnetic divertor, and the potential for oscillating-field current drive to allow steady-state operation. The physics basis, design-point determination, and fusion-power-core engineering are summarized.

17503 **Fusion reactor options and alternatives for the RFP.** Miller, R.L.; Krakowski, R.A.; Bathke, C.G.; Werley, K.A.; Hagenson, R.L. (Los Alamos National Lab., P.O. Box 1663, MS F641, Los Alamos, NM 87544). *Fusion Technology;* **10**: No. 3, 1159-1164(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The poloidal-field-dominated confinement properties of the Reversed-Field Pinch (RFP) are exploited to examine physics and technical issues related to compact, high-power-density fusion reactors. Past studies of the Compact RFP Reactor (CRFPR) were based on a liquid-metal-cooled fusion power core (FPC) that confined high-density plasma at high beta with fields generated by resistive coils. These early framework studies combine with a better conceptual understanding of RFP confinement, impurity control, and current drive to justify further study. A comprehensive systems and trade study has been conducted as part of an ongoing in-depth reactor assessment. Optimal reactor designs, directions, and design sensitivities emerging from this study are described.

17504 **An assessment of multiplexed deployment of advanced commercial tokamaks.** Whitley, R.H.; Lutz, G.R.; Frieje, S.A.; Berwald, D.H.; Gordon, J.D. (TRW Space and Technology Group, One Space Park, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 1165-1170(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A commercial electric plant concept has been developed with multiple advanced tokamak reactors operating at a single site with shared equipment. These multiplexed reactors use superconducting magnets, operate at high beta, and have inductively driven plasma current. The attractiveness of this approach is based on cost reductions which are achieved by the sharing of some components and on availability improvements resulting from the addition of standby equipment. Parametric studies have been performed to determine both the optimal number of reactors in a plant and the optimal reactor characteristics. A plant layout has been developed which uses remote maintenance technologies for operation and maintenance such that at least part of the plant is always operational.

17505 **The fusion applications study - FAME.** Schultz, K.R.; Engholm, B.A.; Bourque, R.F.; Cheng, E.T.; Schaffer, M.J.; Wong, C.P.C. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* **10**: No. 3, 1279-1289(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Fusion Applications and Market Evaluation ("FAME") study, being conducted by GA Technologies for Lawrence Livermore National Laboratory (LLNL) and US Department of Energy, Office of Fusion Energy, (US DOE) is described. This two-year program has a FY86 objective of Evaluating Alternative Applications of Fusion, and a FY87 goal of Exploring Innovative Applications. Applications are being reviewed and categorized into Baseline, Nuclear, Chemical, Electromagnetic, and Thermal application categories. The "traditional" applications of electricity generation, fissile fuel and tritium production, and hydrogen production continue to look attractive. Particularly promising new applications to date, with potential for near-term markets, are isotope production and radiation processing, especially when allied with the traditional application of electricity production. The economics of separate applications as well as coproduction are discussed. The combination of electricity and /sup 60/Co production appears to be one of the most attractive.

17506 **Radioisotope production in fusion reactors.** Engholm, B.A.; Cheng, E.T.; Schultz, K.R. (GA Technologies Inc., San Diego, CA 92138). *Fusion Technology;* **10**: No. 3, 1290-1296(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Radioisotope production in fusion reactors is being investigated as part of the Fusion Applications and Market Evaluation (FAME) study. /sup 60/Co is the most promising such product identified to date, since the /sup 60/Co demand for medical and food sterilization is strong and the potential output from a fusion reactor is high. Some of the other radioisotopes considered are /sup 99/Tc, /sup 131/I, several Eu isotopes, and /sup 210/Po. Among the stable isotopes of interest are /sup 197/Au, /sup 103/Rh and Os. In all cases, heat or electricity can be co-produced from the fusion reactor, with overall attractive economics.

17507 **First wall and vacuum vessel analysis for Compact Ignition Tokamaks.** Listvinsky, G.; Weede, J.J.; Salem, S.L.; Wolfson, A. (TRW Inc., One Space Park, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 514-520(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This paper describes the ongoing analysis efforts supporting the design of the first wall (FW) and vacuum vessel (VV) components for the Compact Ignition Tokamak (CIT). Thermal and stress analyses of FW graphite tiles have established a nominal tile thickness of 1.0 cm and a maximum allowable FW surface heat flux of 11.0 MW/m/sup 2/. Calculations have shown that for a cooldown time of one hour, the required tile to VV thermal conductance is > 0.1 W/K. Estimates of worst-case electromagnetic loads and resulting stresses on the VV during plasma disruptions have shown the maximum stress levels to be below the allowable limits for the VV material. These results demonstrate that the selected FW/VV concept is consistent with the design objectives.

17508 **Summary of recent results from the JAERI/U.S. Fusion Neutronics Phase I Experiments.** Nakamura, T.; Abdou, M.A. (Dept. of Reactor Engineering, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken, 319-11). *Fusion Technology;* **10**: No. 3, 541-548(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A series of integral neutronics experiments is in progress as a collaborative program between Japan Atomic Energy Research Institute (JAERI) and U.S. Department of Energy(DOE) on fusion blanket engineering. Three types of experiments were conducted on lithium oxide as the Phase I of the program. Measured parameters are tritium production rates and neutron spectrum in test blanket modules. The results obtained in the collaboration are described along with the features of this program.

17509 **Analyses and intercomparison for Phase I Fusion Integral Experiments at the FNS Facility.** Youssef, M.Z.; Gung, C.; Nakagawa, M.; Mori, T.; Kosako, K.; Nakamura, T. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California at Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 549-563(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Phase I integral experiments of U.S./JAERI Collaborative Program on Fusion Breeder Neutronics which are carried out at the Fusion Neutronics Source (FNS) facility at JAERI ranged from D-T neutron source characterization experiments, tritium production rate (TPR) measurements in a reference Li/sub 2/0 assembly, first wall experiments with and without coolant simulation and beryllium neutron multiplier experiments in various configurations. Both U.S. and Japan have independently analyzed these experiments using their own data base and codes. Analytical predictions obtained by both countries are compared to measured values. Results of this intercomparison is presented in this paper.

17510 **Status of fusion reactor blanket design.** Smith, D.L.; Sze, D.K. (9700 South Cass Avenue, FPP-205, Argonne, IL 60439-4837). *Fusion Technology;* **10**: No. 3, 599-608(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This paper provides a brief review of the Blanket Comparison and Selection Study (BCSS)/sup 1/ and an overview of more recent fusion reactor blanket design efforts. Specific areas covered include improvements in leading blanket concepts identified in the BCSS, viz., self-cooled liquid metal concepts, helium-cooled solid breeder concepts, and helium-cooled liquid breeder concepts. In addition, a summary of innovative blanket concepts and design features is presented. The key features and critical issues associated with these designs are identified.

17511 **Thin blanket design for MINIMARS - A compact tandem mirror fusion reactor.** Sviatoslavsky, I.N.; Sawan, M.E.; El-Guebaly, L.A.; Wittenberg, L.J.; Corradini, M.L.; Vogelsang, W.F.; Kulcinski, G.L. (Univ. of Wisconsin, Fusion Technology Institute, Nuclear Engineering Dept., 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 609-614(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Recent fusion power reactor designs have shown a trend toward lower power, lower cost, higher mass utilization compact configurations with inherent safety, in order to improve the economic aspects of fusion and make them more competitive with other energy sources. Since the blanket thickness directly impacts the size and mass of the remaining reactor components, it is prudent to minimize its thickness while ensuring adequate neutronic and thermal performance. This paper describes the blanket for the MINI-MARS compact tandem mirror fusion power reactor. The blanket which utilizes HT-9 ferritic steel structure, LiPb breeder, Be multiplier/moderator and He gas cooling is only 17 cm thick and is backed up by a steel reflector. Helium gas cools the blanket and reflector in series and the outlet temperature of 575°C gives a gross thermal power cycle efficiency of 42.7%.

17512 **An inherently safe tandem mirror fusion blanket concept.** Garner, J.K.; Carson, C.F.; Gordon, J.D.; Whitley, R.H. (TRW Inc., One Space Park, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 615-618(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This paper describes a concept for a high performance, inherently safe fusion reactor blanket using helium coolant, beryllium multiplier, lithium breeder and a vanadium alloy structure. The goals of the design were to explore the possibility of inherent tolerance to loss of coolant and flow accidents while minimizing the cost of electricity. Results indicate high net thermal-to-electric conversion efficiency (45.5%), good energy multiplication (1.64) and excellent afterheat tolerance, with a maximum blanket temperature of 760°C after one year with no cooling. However, the calculated COE (0.0405$/kW/sub e/.h) is slightly higher than other blankets costed on a similar basis by the MINIMARS program because of the projected high cost of vanadium.

17513 **Helium-cooled, FLiBe-breeder, beryllium-multiplier blanket for MINIMARS.** Moir, R.W.; Lee, J.D. (Lawrence Livermore National Lab., Univ. of California, P.O. Box 808, L-644, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 619-623(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors adapt the helium-cooled, FLiBe-breeder blanket to the commercial tandem-mirror fusion-reactor design, MINIMARS. Vanadium is used to achieve high performance from the high-energy-release neutron-capture reactions and from the high-temperature operation permitted by the refractory property of the material, which increases the conversion efficiency and decreases the helium-pumping power. Although this blanket has the highest performance among the MINIMARS blankets designs, measured by Mn/sub th/ (blanket energy multiplication times thermal conversion efficiency), it has a cost of electricity (COE) 18% higher than the University of Wisconsin (UW) blanket design (42.5 vs 35.9 mills/kW . h). This increased cost was due to using higher-cost blanket materials (beryllium and vanadium) and a thicker blanket, which resulted in higher-cost central-cell magnets and the need for more blanket materials. Apparently, the high efficiency does not substantially affect the COE. Therefore, in the future, they recommend lowering the helium temperature so that ferritic steel can be used. This will result in a lower-cost blanket, which may compensate for the lower performance resulting from lower efficiency.

17514 **Conceptual design of a self-cooled FLIBE blanket.** Sze, D.K.; Jung, J.; Cheng, E.T.; Piet, S.; Klein, A. (Argonne National Lab., 9700 S. Cass Avenue, FPP-205, Argonne, IL 60439-4837). *Fusion Technology;* **10**: No. 3, 624-632(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A self-cooled Flibe blanket concept is developed. The problems associated with tritium breeding, tritium containment, and corrosion are investigated and potential solutions developed. A highly efficient and compact blanket and power conversion system is incorporated. The resulting system is low pressure with high thermal efficiency and is inherently safe.

17515 **Thin blanket designs for the Elongated Tokamak Commercial Reactor.** Wong, C.P.C.; Bourque, R.F.; Cheng, E.T.; Creedon, R.L.; Schultz, K.R. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* **10**: No. 3, 633-640(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Elongated Tokamak (ET)* is an innovative concept that uses as highly elongated plasma (plasma height-to-width ratio of 6-10) to allow high plasma current and high toroidal betas. ET has the potential for the development of small-size, high-power density, low-cost fusion reactors using normal conducting coils. The elongated plasma shape is achieved by use of a continuous stack of PF coils parallel to the plasma surface on both inbound and outbound

sides. To achieve plasma stability, these coil stacks must be located no further than one plasma minor radius from the plasma edge, greatly restricting the space available for blankets. In order to assess the potential of a small reactor, the authors evaluated and designed blankets 30 to 40 cm thick. Three different thin blanket designs were found to be acceptable: FLiBe self-cooled, helium-cooled lithium, and helium-cooled 17Li83Pb blanket designs. A lithium-cooled integrated blanket-coil design (BLITZ-coil) was also found to be suitable for the ET commercial reactors.

17516 **Applications of the Aqueous Self-Cooled Blanket concept.** Steiner, D.; Embrechts, M.J.; Varsamis, G.; Wrisley, K.; Deutch, L.; Gierszewski, P. (Rensselaer Polytechnic Institute, Troy, NY 12180-3590). *Fusion Technology;* **10**: No. 3, 641-648(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

In this paper a novel water-cooled blanket concept is examined. This concept, designated the Aqueous Self-Cooled Blanket (ASCB), employs water with small amounts of dissolved fertile compounds as both the coolant and the breeding medium. The ASCB concept is reviewed and its application in three different contexts is examined: (1) power reactors; (2) near-term devices such as NET; and (3) fusion-fission hybrids.

17517 **A model for first-wall thermal response to plasma energy deposition.** Carroll, M.C.; Miley, G.H. (Fusion Studies Lab., Nuclear Engineering Dept., Univ. of Illinois, 103 South Goodwin Avenue, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 770-775(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A primarily analytical thermal analysis model is presented which allows for calculation of temperatures in fusion reactor first walls. The model utilizes input from plasma physics calculations coupling a 2-1/2 dimensional geometric analysis with a 1-dimensional heat conduction treatment to determine temperature profiles over the surface of and within the first wall. The results are primarily applicable to the steady-state operation of magnetic confinement devices such as tokamaks. Effects of wall geometry, toroidal curvature, and wall corrugation are considered in computing local power loadings from bremsstrahlung, cyclotron radiation, charged particles, and neutrons. Temperature solutions based on these loadings are developed by expanding into a MacLaurin series and utilizing the principle of superposition. A sequential calculation scheme is employed in lieu of traditional matrix methods in determining temperature distributions in composite walls. The model and corresponding solution methods are applied to three illustrative fusion reactor designs. Significant gains in accuracy are indicated over thermal analysis methods previously used.

17518 **Techniques for measurement of velocity in liquid-metal MHD flows.** Reed, C.B.; Picologlou, B.F.; Dauzvardis, P.V.; Bailey, J.L. (Fusion Power Program, Argonne National Lab., Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 813-821(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Three instruments for measuring local velocities in liquid-metal MHD experiments for fusion blanket applications are being evaluated. The devices are used in room-temperature NaK experiments to measure three-dimensional flow field patterns anticipated in complex blanket geometries. Hot film anemometry, a standard technique in ordinary fluids, is being used, as well as two developmental devices. One is called the Liquid Metal Electromagnetic Velocity Instrument (LEVI), and performs essentially as a local DC electromagnetic flow meter. The third device, a Thermal Transient Anemometer (TTA) is a rugged, yet relatively simple device, which measures local velocity through the mechanism of convective heat transfer, in some ways similar to hot-film anemometry. Results are presented showing the kinds of data collected thus far with each instrument. Measurements include both local velocity measurements and some preliminary frequency analyses of the fluctuating signals from both a hot-film sensor and the LEVI device.

17519 **Uncertainties in liquid metal fusion blanket design windows.** Garner, J.K.; Abdou, M.A. (TRW Inc., One Space Park, R1/1078, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 837-847(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The work reported here attempts to: 1) define limits for the design windows for liquid metal breeders and coolants with various structural materials in various tokamak fusion reactors; and 2) quantify the impact of uncertainties in these limits on the design window. MHD pressure drop and heat transfer models are developed and used to quantify the effects of varying several tokamak reactor and blanket design parameters and materials properties. Uncertainties in the present pressure drop equations and calculational methods are also considered. Calculations are used to evaluate the impact of the coolant inlet temperature on the thermal cycle efficiency. An evaluation of the limits of uncertainty gives results ranging from a promising blanket candidate to a severely restricted design window, that would probably exclude self-cooled liquid metal blankets for large tokamaks from consideration. The major uncertainties in the design window result from the current lack of understanding of pressure drop and heat transfer in strong magnetic fields.

17520 **Lithium-cooled blankets for advanced tokamaks.** Picologlou, B.F.; Cha, Y.S.; Majumdar, S. (Argonne National Lab., 9700 S. Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 848-853(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The reactors considered in the Tokamak Power Systems Studies (TPSS), with their reduced toroidal magnetic flux densities, increased aspect ratios, and moderate overall power outputs afford the possibility of significant improvements and simplification in the design of liquid-metal self-cooled blankets. In designing the first wall and blanket structural, thermal, and magnetohydrodynamic constraints must be satisfied simultaneously. A systematic approach to do so efficiently, and resulting design parameters are presented. Designs with separate limiters can achieve a neutron wall loading capability of about 5 MW/m/sup 2/ with bare structural walls near the first wall and insulated laminated construction in regions of low fluence only. When laminated wall construction is used in the first wall coolant channels, the neutron wall loading capability exceeds 10 MW/m/sup 2/.

17521 **Entry length effects in liquid metal fusion blankets.** Hadid, A.H. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 854-859(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The development of two dimensional velocity and temperature profiles are explored for a conducting fluid in the entrance region of straight ducts in the presence of a magnetic field. The partial-differential equations for the momentum and energy are solved by a finite-difference calculational procedure. In laminar flow parallel to the magnetic field, the magnetohydrodynamic (MHD) force is seen to enhance heat transfer slightly due to the suppression of velocity profile development. In laminar flow perpendicular to the magnetic field, higher fields enhance heat transfer by increasing the flow rate near the wall.

17522 **Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field.** Picologlou, B.F.; Reed, C.B.; Dauzvardis, P.V. (Argonne National Lab., Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 860-865(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An experimental program on liquid metal MHD phenomena relevant to blanket engineering is being carried out at ANL's ALEX facility. The experiments carried out at the facility are aimed towards detailed measurements of 3-D MHD flow character-

istics to enlarge the existing data base and to provide validation of existing analytical approaches. Results of the first series of experiments, dealing with three dimensional MHD effects in a circular thin conducting wall duct in the fringing field of a strong transverse magnetic field, are reported. Comparison of the experimental data with the predictions of pretest analysis both supports the basic premises on which the analysis is based and suggests possible improvements.

17523 **Overview of the TFTR Lithium Blanket Module program.** Jassby, D.L. (Princeton Plasma Physics Lab., Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 925-930(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The LBM (Lithium Blanket Module) is an approximately cubic module, about 80 cm on each side, with construction representative of a helium-cooled lithium oxide fusion reactor blanket module. Measurements of neutron transport and tritium breeding in the LBM will be made in irradiation programs first with a point-neutron source, and subsequently with the D-D and D-T fusion-neutron sources of the TFTR. This paper summarizes the objectives of the LBM program, the design, development and construction of the LBM, and progress in the experimental tests.

17524 **The LBM program at the EPFL/LOTUS Facility.** File, J.; Jassby, D.L.; Tsang, F.Y.; Haldy, P.A.; Leo, W.R.; Woodruff, G. (Princeton Plasma Physics Lab., P.O. Box 451, Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 952-957(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An experimental program of neutron transport studies of the Lithium Blanket Module (LBM) is being carried out with the LOTUS point-neutron source facility at Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland. Preliminary experiments use passive neutron dosimetry within the fuel rods in the LBM central zone, as well as, both thermal extraction and dissolution methods to assay tritium bred in Li/sub 2/O diagnostic wafers and LBM pellets. These measurements are being compared and reconciled with each other and with the predictions of two-dimensional discrete-ordinates and continuous-energy Monte-Carlo analyses of the Lotus/LBM system.

17525 **The neutronic analysis for the LBM/LOTUS experiment.** Kolibal, J.G.; Ku, L.P.; Liew, S.L. (Plasma Physics Lab., Princeton Univ., Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 958-961(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A comparison of the two dimensional discrete ordinates and three dimensional Monte Carlo calculations for the Lithium Blanket Module at the LOTUS facility is made. These models are for comparison with the experimental data.

17526 **Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility.** Tsang, F.Y.; Leo, W.; Sahraoui, C.; Wuthrich, S.; Shaer, M. (Idaho National Engineering Lab., (INEL), Idaho Falls, ID). *Fusion Technology;* **10**: No. 3, 962-971(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A series of passive dosimetry irradiation experiments were performed inside the Lithium Blanket Module (LBM) with the 14-MeV neutron source at the Ecole Polytechnique Federale de Lausane (EPFL). Sets of passive dosimetry foils were utilized to measure fusion-reactor-blanket neutronic environments. The dosimeter reaction data are analyzed and compared with calculational models. These experimental results demonstrate the ability to simulate low power deuterium-tritium (D-T) plasma shots by measuring the neutron field in a reactor-representative fusion blanket environment. The dosimeter results can determine the entire neutron spectrum along the full length of the LBM test rod. The set of selected dosimetry materials meets the requirements of neutronic characterization in future LBM-TFTR D-T and high power deuterium-deuterium (D-D) plasma experiments.

17527 **Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments.** Quanci, J.; Azam, S.; Bertone, P. (Princeton Plasma Physics Lab., Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 972-977(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Lithium Blanket Module (LBM) is an assembly of over 20,000 cylindrical lithium oxide pellets in an array representative of a limited-coverage breeding zone for a toroidal fusion device. A principal objective of the LBM program is to test the ability of advanced neutronics coding to model the tritium breeding characteristics of a fusion device blanket. The LBM has been irradiated at the Ecole Polytechnique Federale de Lausanne (EPFL) LOTUS facility with a 14 MeV point-neutron source. Princeton Plasma Physics Laboratory (PPPL) and EPFL assayed the tritium bred in lithium oxide diagnostic samples placed at various positions in the LBM. PPPL employed a thermal extraction technique while EPFL used a dissolution method. The results for the assay are reported and compared to MCNP Monte Carlo neutronics calculations for the LBM/LOTUS system.

17528 **Measurements of reactor-relevant electromagnetic effects with the FELIX facility.** Turner, L.R.; Hua, T.Q.; Knott, M.J.; Lee, S.Y.; McGhee, D.G.; Wehrle, R.B. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 1053-1058(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Recent experiments with the FELIX (Fusion Electromagnetic Induction eXperiment) facility at Argonne National Laboratory (ANL) suggest that the expected electromagnetic forces and torques in a tokamak first wall, blanket, and shield (FWBS) system can be modelled by a single eddy current mode, with a simple characterization.

17529 **Technical requirements of experiments and facilities for fusion nuclear technology.** Abdou, M.; Gierszewski, P.; Tillack, M.; Grover, J.; Puigh, R.; Sze, D.K.; Berwald, D. (Univ. of California, Los Angeles, CA). *Fusion Technology;* **10**: No. 3, 1065-1078(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The technical issues and requirements of experiments and facilities for fusion nuclear technology (FNT) are investigated. The nuclear subsystems addressed are: a) blanket; b) radiation shield; c) tritium processing system; and d) plasma interactive components. Emphasis is placed on the important and complex development problems of the blanket. A technical planning process for FNT is developed and applied, including four major elements: 1) characterization of issues; 2) quantification of testing requirements; 3) evaluation of facilities; and 4) development of a test plan to identify the role, timing, characteristics and costs of major experiments and facilities.

17530 **Required momentum, heat, and mass transport experiments for liquid metal blankets.** Tillack, M.S.; Sze, D.K.; Abdou, M.A. (Mechanical, Aerospace, and Nuclear Engineering Dept., The Univ. of California, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1088-1096(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The lack of experimental data for liquid metal blankets in the fusion environment restricts our ability to develop designs with demonstrated feasibility and adequately characterized performance. In order to confidently predict neutronic and thermal hydraulic performance of blankets, a variety of experiments will be needed. Ultimately, verification of all nuclear components will require testing in a fusion environment. However, a great deal of information can be obtained prior to fusion testing using non-neutron facilities to explore separate, multiple, and partially integrated effects. A large class of issues which can be effectively studied in a non-neu-

tron environment are those impacted by MHD transport phenomena. A coordinated test program is described to treat momentum, heat, and mass transport issues for liquid metal blankets.

17531 **Fission reactor experiments for solid breeder blankets.** Gierszewski, P.J.; Abdou, M.A.; Puigh, R. (Univ. of California at Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1097-1101(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The testing needs for solid breeder blanket development are different from those for liquid breeder blankets. In particular, a reasonable number of moderate volume test sites in a neutron environment are needed. Existing fission reactors are shown to be able to provide this environment with reasonable simulation of many important blanket conditions. Three major additional fission reactor tests are identified beyond those presently underway. These are thermal behavior, advanced in-situ tritium recovery and nuclear submodule experiments.

17532 **Issues and test requirements in radiation shielding of fusion reactors.** Nakagawa, M.; Abdou, M.A. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1123-1132(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Radiation shield issues for fusion reactors have been investigated and the experiments and facilities required to resolve the issues have been identified and characterized as part of the FINESSE program. This paper summarizes the recommended approach to fusion shield research and development, provides a summary of the necessary experiments and facilities, and presents the results of technical analyses involved.

17533 **The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets.** Ghoniem, N.M.; Firestone, M.A.; Conn, R.W. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1133-1145(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Operational aspects of a model tokamak system with a solid-breeder blanket are presented. The model blanket is an evolution of the STARFIRE and BCSS design studies. Full-power reactor operation is at a neutron wall loading of 5 MW/m/sup 2/ and a surface heat flux of 1 MW/m/sup 2/. The blanket is a pressurized steel module with bare beryllium rods and low-activation HT-9-(9-C-) clad LiAlO/sub 2/ rods. The helium coolant pressure is 5 MPa, entering the module at 297°C and exiting at 550°C. The system power output is rated at 1000 MW(e). In this paper, the authors present their findings on various operational scenarios and their impact on system design. They first start with the salient aspects of operational physics. Time-dependent analyses of the blanket and balance of plant are then presented.

17534 **Nuclear performance optimization of the molten-salt fusion breeder.** Lee, J.D.; Bandini, B.R. (Lawrence Livermore National Lab., Univ. of California, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1309-1314(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Improved nuclear analysis, including the treatment of resonance and spatial self-shielding, coupled with an optimization procedure, has resulted in an improved performance estimate for the molten salt blanket. Net U-233 breeding ratio ranges between 0.58 and 0.63, and blanket energy multiplication ranges between 1.8 and 1.9.

17535 **System studies of Compact Ignition Tokamaks.** Galambos, J.D.; Peng, Y.K.M.; Blackfield, D.T. (Oak Ridge National Lab., Fusion Engineering Design Center, Post Office Box Y, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 498-503(Nov 1986). (CONF-860652—). Contract AC05-84OR21400.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Fusion Engineering Design Center (FEDC) Tokamak Systems Code is used to perform trade studies in accordance with the Compact Ignition Tokamak (CIT) physics and engineering guidelines. The authors examine various toroidal field coil (TFC) configurations, preload levels, and coil materials. Use of Inconel-copper composite material results in the smallest sized devices for both bucked and wedged TFCs and wedged-only TFCs. Preload levels of 23 Mkg are needed for the minimum sized devices, and for the lower strength materials, the minimum size is sensitive to the preload level. Results from these trade studies help lead to the choice of the baseline CIT point at R = 1.25 m and B = 10.4 T.

17536 **PF coil system comparisons for a compact ignition device.** Pillsbury, R.D. Jr.; Schultz, J.H.; Thome, R.J. (Plasma Fusion Center, NW17-223, Massachusetts Institute of Technology, Cambridge, MA 02139). *Fusion Technology;* **10**: No. 3, 504-507(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Preliminary designs for the poloidal field coil system for several alternative concepts for the Ignition Studies Project are analyzed. Options include both a limiter and divertor configuration with PF coils located internal to the TF coil, external to the TF coil, and a mixture of internal and external (hybrid coils). The effect of the system parameters of ampere-meters, stored and dissipated energy, and peak requirements are reported. The all internal coil configuration for the diverted plasma has significantly lower ampere-meters, energy, and power requirements. However, internal coils are disadvantageous from the remote maintenance standpoint.

17537 **Design study and supporting experiments for an axially symmetric anchor for a tandem mirror.** Kunze, J.F.; Prelas, M.A.; Dolan, T.J.; Bennett, P.; Freeman, J.M.; Haynes, L.; Hwang, J.L.; McGhee, S.D.; Roberts, R. (Univ. of Missouri, College of Engineering, Columbia, MO 65211). *Fusion Technology;* **10**: No. 3, 1034-1040(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

In order to determine if a simple magnetic cusp, which is axisymmetric, can be used as an end cell (anchor and plug) for a tandem mirror reactor, a large (50 cm) bore, superconducting, magnetic cusp is being built at the University of Missouri. Prior to the construction of this device, an approximately half scale normal magnetic cusp was built, and experiments involving ECRF heating were conducted, to better establish the design conditions for the large, high field (4-Tesla) cusp.

17538 **Liquid nitrogen cooling considerations of the Compact Ignition Tokamak.** Dabiri, A.E. (Fusion Engineering Design Center/SAIC, P.O. Box Y, FEDC Building, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 521-526(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A simple analytical procedure is developed to estimate the cooldown time between pulses of the Compact Ignition Tokamak (CIT) utilizing liquid nitrogen. Fairly good agreement is obtained between the analysis results and those measured in the early fusion experimental devices. The cooldown time between pulses in the CIT is controlled by the energy deposition in the inner leg of the TF coil. A cooldown time of less than 1 h is feasible. An R&D experimental program is required to determine the actual cooldown time between pulses since this would be considered an issue in the conceptual design of the CIT.

17539 **An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor.** Finn, P.A.; Brooks, J.N.; Ehst, D.A.; Gohar, Y.; Mattas, R.F.; Baker, C.C. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 902-907(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The benefits and limitations arising from the use of polarized deuterium-tritium fuels are assessed for commercial tokamak fusion reactors. The difference in capital costs for a reactor with and without polarized fueling is quantified for two reactors, one with a beta of 0.067 and a major radius of 7 m and the second with a beta of 0.25 and a major radius of 5.25 m. The change in reactor performance is also quantified. The conclusion is that the sum of all benefits associated with the use of polarized fuels does not result in a significant improvement in the tokamak reactor economics.

17540 **A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries.** Cheng, E.T.; Pelloni, S. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* **10**: No. 3, 978-984(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A preliminary comparative neutronics study shows that there are large discrepancies in the /sup 6/Li(n,α)T and /sup 7/ Li(n,n'α)T reaction rates calculated for top-ranking fusion blanket concepts with the JEF-1- and ENDF/B-V- based nuclear data libraries. Detailed analysis is necessary and data testing integral experiments should be employed to identify the deficiencies in these nuclear data evaluations.

17541 **A folded waveguide coupler for ion cyclotron heating.** Owens, T.L.; Chen, G.L. (McDonnell Douglas Astronautics Co., Dept. E451, P.O. Box 516, St. Louis, MO 63166). *Fusion Technology;* **10**: No. 3, 1024-1029(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A new type of waveguide coupler for plasma heating in the ion cyclotron range of frequencies is described. The coupler consists of a series of interleaved metallic vanes within a rectangular enclosure analogous to a wide rectangular waveguide that has been "folded" several times. At the mouth of the coupler, a plate is attached which contains coupling apertures in each fold or every other fold of the waveguide, depending upon the wavenumber spectrum desired. This plate serves primarily as a wave field polarizer that converts coupler fields to the polarization of the fast magnetosonic wave within the plasma. Theoretical estimates indicate that the folded waveguide is capable of high-efficiency, multi-megawatt operation into a plasma. Bench tests have verified the predicted field structure within the waveguide in preparation for high-power tests on the Radio Frequency Test Facility at the Oak Ridge National Laboratory.

17542 **Free electron masers for tokamak applications.** Wagner, C.E.; Boehmer, H.; Caponi, M.Z. (TRW Inc., Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 1030-1033(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The technology of the free electron maser (FEM) has advanced to where it now is an attractive source for electron cyclotron heating (ECH) in tokamaks at reasonable cost. FEM's are capable of producing CW power at frequencies 50-400 GHz with power levels up to 5 MW/module. They can operate as a high gain (30-40 db), wide band amplifier ($\Delta f/f$ = 5-10%). Such systems incorporate high quality (low emittance and energy spread) electron beams of moderate current which are electrostatically accelerated before passing through a large amplitude wiggler. Highly efficient recovery of the energy from the "spent" beam is feasible and enhances the total FEM system energy to nearly 50% even though the beam extraction efficiency is rather modest.

17543 **Super high field ohmically heated tokamak operation.** Cohn, D.R.; Bromberg, L.; Leclaire, R.J.; Potok, R.E.; Jassby, D.L. (MIT Plasma Fusion Center, Cambridge, MA 02139). *Fusion Technology;* **10**: No. 3, 1111-1116(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors discuss a super high field mode of tokamak operation that uses ohmic heating or near ohmic heating to ignition. The super high field mode of operation uses very high values of B/ sup 2/α, where B is the magnetic field and a is the minor radius (B/sup 2/α > 100 T/sup 2/m). We analyze copper magnet devices with major radii from 1.7 to 3.0 meters. Minimizing or eliminating the need for auxiliary heating has the potential advantages of reducing uncertainty in extrapolating the energy confinement time of current tokamak devices, and reducing engineering problems associated with large auxiliary heating requirements. It may be possible to heat relatively short pulse, inertially cooled tokamaks to ignition with ohmic power alone. However, there may be advantages in using a very small amount of auxiliary power (less than the ohmic heating power) to boost the ohmic heating and provide a faster start-up, expecially in relatively compact devices.

17544 **Tritium technology studies at the Tritium Systems Test Assembly.** Anderson, J.L.; Bartlit, J.R. (Materials Science and Technology Div., Los Alamos National Lab., Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1329-1333(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Tritium Systems Test Assembly (TSTA) at the Los Alamos National Laboratory has been in operation with tritium since June 1984. Presently there are some 30 g of tritium in the main process loop. This 30 g has been sufficient to do a number of experiments involving the cryogenic distillation isotope separation systems. In January 1986, two major experiments were conducted. During these experiments the fuel cleanup system was interfaced, through the transfer pumping system with the isotope separation system, thus permitting testing on the integrated fuel processing loop. This integration of these systems means that of the TSTA subsystem only the vacuum system remains to be integrated into the TSTA fuel processing loop. In the period of June 1984 through May 1986, the TSTA system had processed approximately 10/sup 8/ Ci of tritium. Total tritium emissions to the environment over this period have been less than 3 Ci as elemental tritium and 2 Ci as tritium oxide. Personnel exposures during this period have totaled less than 100 person-mRem. To date, the development of tritium technology at TSTA has proceeded in progressive and orderly steps. In two years of operation with tritium, no major design flaws have been uncovered.

17545 **Residual tritiated water in molecular sieves.** Nasise, J.E.; Carlson, R.V.; Jalbert, R.A. (Materials Science and Technology Div., Los Alamos National Lab., Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1334-1339(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Experiments are described which demonstrate that tritiated water inventory on molecular sieve can be reduced by loading the molecular sieve with water and subsequent regeneration. These experiments also show that to achieve low dewpoints air streams from a molecular sieve drying bed, regenerations times are much longer than routinely used in detritiation systems.

17546 **Inherent/passive safety for fusion.** Piet, S.J. (EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415). *Fusion Technology;* **10**: No. 3, 1191-1196(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The concept of inherent or passive safety for fusion energy is explored, defined, and partially quantified. Four levels of safety assurance are defined, which range from true inherent safety to passive safety to protection via active engineered safeguard systems. Fusion has the clear potential for achieving inherent or passive

safety, which should be an objective of fusion research and design. Proper material choice might lead to both inherent safety and high mass power density, improving both safety and economics. When inherent safety is accomplished, fusion will be well on the way to achieving its ultimate potential and to be truly different and superior.

17547 **Fusion blanket inherent safety assessment.** Sze, D.K.; Jung, J.; Cheng, E.T. (Argonne National Lab., 9700 South Cass Avenue, FPP-205, Argonne, IL 60439-4837). *Fusion Technology;* **10**: No. 3, 1197-1204(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The inherent safety aspect of Tokamak Power System Studies (TPSS) reactor blankets is investigated. The idea is to design the blanket so safe that cost savings can be realized such as through non-nuclear grading construction. If the blanket materials are carefully selected, inherent safety is feasible for fusion reactor blankets up to 5-10 MW/m/sup 2/ neutron wall loading.

17548 **Passive decay heat removal in liquid-metal cooled reactors.** Malinovic, B.; Kazimi, M.S. (Dept. of Nuclear Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139). *Fusion Technology;* **10**: No. 3, 1205-1210(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The response of liquid metal self-cooled fusion reactors to a loss of flow accident (LOFA) is investigated. Coolant temperature rise through the blanket was determined for conditions where decay heat is removed solely by natural convection. It is found that lithium-lead (Li17-Pb83) coolant provides sufficient natural convection to remove decay heat in both tokamak and TMR designs with a reasonable temperature rise. With pure lithium coolant, however, decay heat removal by natural convection proves difficult without excessive temperature rise. A transient analysis reveals that there should be ample time to respond to a LOFA if the plasma is shut down promptly.

17549 **Some safety considerations of liquid lithium as a fusion breeder material.** Jeppson, D.W.; Muhlestein, L.D. (Westinghouse Hanford Co., Hanford Engineering Development Lab., P.O. Box 1970, Richland, WA 99352). *Fusion Technology;* **10**: No. 3, 1211-1215(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Test results and conclusions are presented for the reaction of steam with a high temperature lithium pool and for the reaction of high temperature lithium spray with a nitrogen atmosphere. The reactions are characterized and evaluated in regard to the potential for mobilization of radioactive species associated with the liquid breeder under postulated fusion reactor accident conditions. These evaluations include measured lithium temperature responses, atmosphere temperature and pressure responses, gas consumption and generation, aerosol quantities and particle size characterization, and potentially radioactive species releases. Conclusions are made as to the consequences of these safety considerations for the use of lithium as a fusion reactor breeder material.

17550 **Survey of selected magnet failures and accidents.** Thome, R.J.; Czirr, J.B.; Schultz, J.H. (Plasma Fusion Center, MIT, NW17-205, Cambridge, MA 0219). *Fusion Technology;* **10**: No. 3, 1216-1222(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A survey was conducted among the major centers of large magnet development and operation in the USA to obtain information on magnet system failure and accident events. This paper summarizes the results in four tables which indicate the criticality, "why," "where," and "how" of the reported events. A brief summary of each of the 31 events covered in the survey is also included.

17551 **Contamination of aluminum and painted surfaces exposed to tritium.** Jalbert, R.A.; Brereton, S.J.; Holland, D.F. (Los Alamos National Lab., Health, Safety, and Environment Div., Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1223-1227(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

To study the problem of outgassing of contaminated room surfaces following a significant tritium (T) room release, painted metal strips were exposed to tritium (T/sub 2/ or HTO) and the outgassing rates measured. This was followed by exposures in a 1-m/sup 3/ chamber, whose walls were coated with the material to be studied. The results show that the differences in the contamination of, and subsequent outgassing by, several epoxy and latex paints may be significant. The greatest differences, however, were the much higher contamination following exposure to HTO compared to T/sub 2/, and the lower contamination of exposed bare aluminium foil compared to painted surfaces, for both HTO and T/sub 2/.

17552 **Laser generation of particles to simulate aerosols from fusion systems.** Hoover, M.D.; Allen, M.D.; Simpson, R.B.; Yeh, H.C. (Lovelace Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87185-5890). *Fusion Technology;* **10**: No. 3, 1228-1233(Nov 1986). (CONF-860652—). Contract AC04-76EV01013.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A pulsed Nd:YAG laser is being used to aerosolize material from the surface of metal targets to simulate particles created in fusion energy systems. Targets in the form of rods up to 2-cm diameter can be attached to a screw mechanism that exposes a fresh surface for each laser pulse. Energies up to 20 J/pulse can be applied to the target, at pulse rates from a single shot to 300 Hz. Energy can be focused on an area with diameter less than 500 μm. Stainless steel and aluminium targets were used in a demonstration of system performance. The branched-chain ultrafine aggregate aerosols that were produced appeared to result from direct vaporization/condensation of material from the surface of the target located under the center of the laser beam, and from ejection of molten droplets from the target surface.

17553 **TFTR offsite dose levels from fusion radiation and effluent releases.** Kolibal, J.G.; Ku, L.P.; Liew, S.L. (Plasma Physics Lab., Princeton Univ., Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 1234-1242(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A comprehensive assessment of the offsite radiological impact of the operation of the Tokamak Fusion Test Reactor is made. This includes a review of the dose levels from instantaneous fusion radiation for the case with no first shield wall around the tokamak, and from the release of radionuclides to the air. The dispersion analysis is based on local on-site meteorological data which has recently become available.

17554 **In-situ MHD energy conversion for fusion.** Campbell, R.B.; Logan, B.G.; Hoffman, M.A. (TRW Corp., Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 881-889(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An advanced concept, in-situ MHD conversion, is described for converting fusion energy to electricity. Considerable cost savings can be realized because of the conversion of thermal energy to electricity achieved in the blanket by means of magnetohydrodynamic (MHD) generators. The external disk generator, also described, is another application of the MHD idea, which may have certain advantages over the in-situ scheme for advanced-fuel tokamaks. The feature that makes these schemes fusion-specific is the novel use of the electromagnetic radiation naturally emitted by the plasma. The synchrotron radiation can be used either to heat the nonequilibrium MHD plasma, or possibly improve its stability. A Rankine cycle with cesium-seeded mercury as a working fluid is used in either case. Performance predictions by a quasi-one-dimen-

sional model are presented. An experiment to determine the effect of microwave radiation on channel performance is planned.

17555 **Direct converter design for the MINIMARS Tandem Mirror Reactor.** Luzzi, T.E.; Clarkson, I.R. (Grumman Corp., Bethpage, NY 11714). *Fusion Technology;* **10**: No. 3, 908-913(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors report on the final design of the direct converter for MINIMARS, a tandem mirror power reactor project at the Lawrence Livermore National Laboratory. The project objectives are to design a plant to produce electricity at less than 50 mils/kWh and design an inherently safe plasma shutdown and heat transport system that sustains no damage from loss of coolant and loss of flow. The direct converter coolant like the blanket coolant is used to generate primary turbine steam. All thermo and structural load bearing elements are designed for the reactor lifetime. The halo scraper sputter lifetime is five full power years. The power to circulate the helium coolant through the direct converter elements is less than 5% of the thermal power recovered.

17556 **ICF drivers: A comparison of some new entries and old standbys.** Hogan, W.J. (Lawrence Livermore National Lab., P.O. Box 5508, L-480, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 649-655(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

There has been a great deal of progress in recent years on the development of solid state and KrF lasers, light ion diodes, and heavy ion accelerators for use as drivers in inertial confinement fusion (ICF) facilities. Two relatively new entries in the ICF driver derby are the free electron lasers (FEL) and the compact torus (CT). The status and remaining technological challenges of each potential driver are described. The author discusses driver performance criteria for various reactor applications and then gives his informed opinion in a qualitative rating of the six drivers for each application.

17557 **Ion beam trapping in plasma channels for light ion inertial confinement fusion.** Watrous, J.J.; Olson, R.E. (Target Experiments, Div. 1263, Sandia National Labs., Albuquerque, NM 87185). *Fusion Technology;* **10**: No. 3, 664-673(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Conservation laws and solutions to ion equations of motion have been used to obtain estimates of the maximum ion beam power that can be injected into and trapped within z-discharge plasma channels. Consequences of the results of these calculations for ongoing designs of light ion driven inertial confinement fusion experiments and reactor concepts are discussed.

17558 **Conceptual design of a large E-beam-pumped KrF laser for ICF commercial applications.** Harris, D.B.; Waganer, L.M.; Zuckerman, D.S.; Bowers, D.A. (Los Alamos National Lab., P.O. Box 1663, MS F611, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 674-676(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Two types of KrF lasers appear attractive as a driver for an ICF electric power plant. The original concept uses large electron-beam-pumped amplifiers and pure angular multiplexing to deliver short, shaped pulses to the target. A recently conceived alternate concept uses many small, long-pulse e-beam sustained discharge lasers which transfer their energy through the forward Raman process to a multiplexed set of beams to deliver the energy to target. Preliminary comparisons of the two systems indicate that the original concept has both a lower cost and a lower system efficiency, and both concepts appear to be nearly equally attractive as an ICF driver for an electric power plant. This paper examines a 4.8 MJ, 5 Hz KrF laser system designed using the original concept. The laser uses 24 main amplifiers arranged in eight sets of three amplifiers each. This layout optimizes both the optical system and the gas flow system, and uses a simple target illumination scheme that provides neutron shielding to allow hands-on maintenance in the laser hall.

17559 **Conceptual design of a hybrid KrF laser system for ICF commercial applications.** Harris, D.B.; Lowenthal, D.D. (Los Alamos National Lab., P.O. Box 1663, MS F611, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 677-678(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

KrF lasers appear to be the most efficient lasers operating near the optimal wavelength for laser fusion. Most high-efficiency, low-cost KrF laser designs use large electron-beam driven amplifiers and use pure angular multiplexing for the required pulse compression. A recent study carried out by Los Alamos and Spectra Technology has defined a high-efficiency hybrid KrF laser system architecture that uses both angular multiplexing and Raman beam combination. The high overall system efficiency of this hybrid design, approximately 12%, is achieved primarily through the use of e-beam sustained discharge lasers (EBSDL), and by using the efficient forward rotational Raman process in hydrogen. The new system appears attractive as a commercial-applications driver because the calculated efficiency is higher than the usual large e-beam pumped (EBP) KrF laser/pure angular multiplexing approach. In this paper, the hybrid system architecture is described, and the tradeoffs with respect to the large EBP amplifier/angular multiplexed system are discussed.

17560 **The Compact Torus Accelerator: A driver for ICF.** Tobin, M.T.; Meier, W.R.; Morse, E.C. (Lawrence Livermore National Lab., P.O. Box 5508, L-480, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 679-685(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors have carried out further investigations of technical issues associated with using a compact torus (CT) accelerator as a driver for inertial confinement fusion (ICF). In a CT accelerator, a magnetically-confined, torus-shaped plasma is compressed, accelerated and focused by two concentric electrodes. They evaluate an accelerator point design with a capacitor bank energy of 9.2 MJ. Modeled by a O-D code, the system produces a xenon plasma ring with a radius of 0.73 cm, a velocity of 4x10/sup 7/m/s, and a mass of 4.4 μg. The plasma ring energy available for fusion is 3.8 MJ, a 40% driver efficiency. Ablation and magnetic pressures of the point design, due to CT acceleration, are analyzed. Pulsed-power switching limitations and driver cost analysis are also presented. Our studies confirm the feasibility of producing a ring to induce fusion with acceptable gain. However, some uncertainties must be resolved to establish viability.

17561 **Initiation of long electrical discharges in dense ICF reactor atmospheres.** Kislev, H.; Micklich, B.J. (Dept. of Nuclear Engineering, Univ. of Illinois at Urbana-Champaign, 103 S. Goodwin Avenue, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 686-694(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The initiation of straight breakdown paths has been identified as the key issue of the LIB propagation channel formation scheme in the HWIFR dense atmosphere. Straight preionization trails have been suggested as means for guiding the breakdown along the designated beamlines. A multi-group Boltzmann equation solver has been constructed for estimating the capability of several preionizers to induce such trails in dense D/sub 2/O vapors. A new approach capable of predicting the steady state streamer wave shape is used to estimate the minimum conditions for launching a streamer in the preionized path. The electrical resistance of the trail during the streamer propagation is evaluated with a simple one dimensional routine. Finally the transition of the streamer induced ionized filament to a multi-kA-carrying plasma channel is simulated with a modified radiation MHD code. Other results of this study, including the determination of the preionizer intensity and the minimum applied potential required for the initiation, are presented in this paper.

17562 **Turbostar: An ICF reactor using both direct and thermal power conversion.** Pitts, J.H. (Lawrence Livermore National Lab., P.O. Box 5508, L-480, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 695-703(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Combining direct and thermal power conversion results in a 52% gross plant efficiency with DT fuel and 68% with advanced DD fuel. The authors maximize the fraction of fusion-yield energy converted to kinetic energy in a liquid-lithium blanket, and use this energy directly with turbine generators to produce electricity. They use the remainder of the energy to produce electricity in a standard Rankine thermal power conversion cycle.

17563 **Heavy-ion fusion target cost model.** Pendergrass, J.H.; Harris, D.B.; Dudziak, D.J.; Billman, K.W. (Los Alamos National Lab., P.O. Box 1663, Mail Stop F611, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1243-1244(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Previous inertial confinement fusion (ICF) commercial-applications studies typically used simple treatments for target costs due to optimism about low (and hence less-important) costs, limited target concept and mass-production process definition, limited resources for analysis, and concentration on point designs. Examples include a fixed cost per target and a fixed target factory capital cost, multiplied by a fixed O&M cost factor, and a fixed target materials cost. Recent studies indicate larger target cost contributions to total power production cost than the $< 10\%$ assumed in many earlier studies, especially for high pulse repetition rates and low target gains. The Heavy-Ion Fusion Systems Assessment (HIFSA) study will include more realistic estimates for target costs. The HIFSA project is a study led by Los Alamos of the prospects for successful commercial ICF electric power using heavy-ion induction linear accelerator (linac) drivers. It assembled unique resources from national laboratories, universities, and industry permitting significant advances in commercial-applications HIF target and mass-production process characterization. The project includes optimization studies with significantly different target concepts requiring improved target cost models for meaningful comparisons. In addition to target performance parameters, optimum target designs depend on driver, reactor, fuel cycle and balance-of-plant system characteristics for which several alternative concepts have been proposed. Therefore, generic stand-alone target cost/performance models that can be interfaced with a wide variety of cost/performance models for other plant systems are being developed for the HIFSA study.

17564 **Improved understanding of first-wall vaporization-condensation in inertial confinement fusion reactors.** Orth, C.D. (Lawrence Livermore National Lab., P.O. Box 5508, L-481, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1245-1250(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors report approximate x-ray and debris spectra emanating from a region of compressed DT fuel representing the imploded configuration of a generic direct-drive ICF reactor pellet. They show how the spectra are modified by spherical lead shields of various thicknesses placed near the pellet, and show that it is not possible to lessen the ablation of the first wall or blanket of a low-pressure ICF reactor chamber through use of such shields. Then they report that the calculated x-ray spectra alone (i.e., without the associated debris) cause vaporization of a first wall placed at a radius of 4 m that is much more than previously expected. This result increases the importance of understanding the details of the vaporization and condensation phenomena.

17565 **Scaling of vaporization and condensation in heavy ion fusion reactors.** Peterson, R.R. (Dept. of Nuclear Engineering, Univ. of Wisconsin-Madison, 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1251-1252(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The vaporization and condensation of material in the reaction chamber of a heavy ion beam driven Inertial Confinement Fusion (ICF) reactor can have important consequences on the facility design. The condensation of material that has been vaporized by energy from the target can limit the rate at which targets can be exploded. The repetition rate is limited because, depending on the mode of propagation of heavy ions to the target, there are limits on the density of vapor in the reaction chambers at the time of beam injection. If the mission of the reactor is to produce commercial electric power, limitation of the repetition rate can greatly affect the cost of electricity, while additional reaction chambers can make the overall plant design much more complicated.

17566 **Numerical simulation of an ICF target explosion in a stratified gas atmosphere.** Bartel, T.J.; Peterson, R.R.; Moses, G.A. (Fusion Technology Institute, Univ. of Wisconsin, 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1253-1258(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Two-dimensional radiation hydrodynamic simulations of a light ion fusion target generated microfireball in a stratified gas atmosphere have been performed. The target location in a two region cavity was varied with the intent to reduce the overpressure on the diodes at the walls of a target chamber with a single cavity gas. Helium and nitrogen at 15 torr were used as the cavity gases; target explosions of 200 and 800 MJ were investigated. It was found that placing the target in a helium region surrounded by nitrogen could reduce the overpressure by a factor of 2 when compared with a single gas cavity of nitrogen. The surface heat flux was also reduced from a pure helium gas cavity.

17567 **MHD energy conversion with advanced-fuel ion beam fusion.** Miley, G.H. (Fusion Studies Lab., Univ. of Illinois, Dept. of Nuclear Engineering, 103 South Goodwin Avenue, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 1259-1263(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This study considers variations in a basic deuterium-burning target design (AFLINT) that modify the output energy split among neutrons, X-rays, and charged particles. Use of a liquid metal MHD cycle to extract energy from a twin-fall reaction chamber (LOTRIT) that uses these targets is also described.

17568 **Liquid momentum removal using rod arrays applied to the HYLIFE ICF reactor.** Raffray, A.R.; Hoffman, M.A. (Mechanical, Aerospace, and Nuclear Engineering Dept., Univ. of California, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1264-1269(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This research relates to the multiple liquid-lithium-jet blanket concept for the HYLIFE inertial-confinement fusion (ICF) reactor. The fusion micro-explosion would result in part of the liquid lithium being propelled towards the vacuum chamber wall where the resulting impact would cause high peak stresses. In an attempt to reduce these peak stresses, it was proposed to set up an array of bars between the vacuum vessel first wall and the liquid jets so that part of the liquid momentum would be removed as the liquid passed through the bars. A series of small-scale scoping experiments were run to obtain a preliminary evaluation of the effectiveness of such rod arrays in removing momentum from impinging liquid slugs. The impact force of an unconfined cylindrical water jet on in-line and staggered rod arrays was measured. The results indicate that the fraction of momentum removed from liquid slugs could probably exceed 18% for a staggered rod arrangement in the HYLIFE reactor.

17569 **A fiber sensor neutron streak camera for ICF diagnostics.** Kislev, H.; Miley, G.H. (Fusion Studies Lab., Nuclear Engineering Dept., Univ. of Illinois, 103 South Goodwin Avenue, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 1270-1278(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors propose an optical sensing based neutron streak camera for ICF burn studies. The conversion of the neutron flux to optical signal is gained through measuring the time dependent optical attenuation (darkening) of a fissile material doped fiber optics. The miniature sensor enables a sensing distance of > 2 cm from the target, such that the neutron doppler broadening can be neglected. An additional major advantage over the current designs is that the streak camera is removed from the intense radiation field. Estimates of minimum yield requirements, darkening time response, and overall temporal resolution are presented.

17570 **Maintainability features of the Compact Ignition Tokamak.** Spampinato, P.T.; Bushnell, C.W. (Fusion Engineering Design Center, Grumman Aerospace Corp., Oak Ridge National Lab., P.O. Box Y, FEDC Building, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 527-532(Nov 1986). (CONF-860652—). Contract AC05-84OR21400.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Compact Ignition Tokamak is envisaged to be the next experimental reactor in the U.S. Fusion Program. Its use of deuterium/tritium fuel requires the implementation of remote handling technology for maintenance and disassembly operations. The reactor is surrounded by a close-proximity nuclear shield which is designed to permit personnel access within the test cell, one day after shutdown. With the shield in place, certain maintenance activities in the test may be done hands-on. Maintenance on the reactor is accomplished remotely using a crane-mounted manipulator after disassembling the shield. Maintenance within the plasma chamber is accomplished with two articulated boom manipulators that are capable of operating in a vacuum environment. They are stored in a vacuum enclosure behind movable shield plugs. The maintenance-related facilities are the test cell, hot cell, decontamination cell, warm cell, and the fabrication, assembly, and mockup building.

17571 **TFTR basement radiation fluence calculations and comparisons with measurements.** Liew, S.L.; Ku, L.P.; Kolibal, J.G. (Plasma Physics Lab., Princeton Univ., Princeton, NJ 08544). *Fusion Technology;* **10**: No. 3, 591-598(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Neutron and γ-ray fluences in the diagnostic basement of the Tokamak Fusion Test Reactor (TFTR) facility are calculated with realistic three-dimensional Monte Carlo models. Comparisons with measurements show that the results are well within the experimental uncertainties.

17572 **Radiation effects on structural ceramics in fusion.** Hopkins, G.R.; Price, R.J.; Trester, P.W. (GA Technologies Inc., P.O. Box 85608, San Diego, CA 92138). *Fusion Technology;* **10**: No. 3, 719-727(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The use of ceramics in fusion power reactors is reviewed. Radiation effects can limit the useful lifetime of ceramic components by changing the dimensions, mechanical properties, thermal conductivity, and electrical properties. The brittleness and statistical spread in strength of monolithic ceramics causes problems for mechanical design which may be alleviated by the use of new ceramic/ceramic composites. Recently developed SiC fiber/SiC matrix composites have good mechanical properties which are likely to be retained after neutron irradiation.

17573 **Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development.** Lucas, G.E.; Odette, G.R.; Sheckherd, J.W.; Krishnadev, M.R. (Dept. of Chemical and Nuclear Engineering, Univ. of California, Santa Barbara, CA 93106). *Fusion Technology;* **10**: No. 3, 728-733(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Charpy impact specimens, one third the size of standard specimens in all dimensions have been tested for a variety of steels and the data are compared to standard specimen data. The absorbed energy curves are qualitatively similar for both specimen types, and quantitative evaluations of dynamic yield strength and cleavage fracture stress are similar as well. However, differences in constraint between standard and subsized specimens must be accounted for, and these differences are influenced by the flow behavior of the test material.

17574 **Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes.** Glasgow, B.B.; Wolfer, W.G. (Nuclear Engineering, Univ. of Wisconsin, Madison, WI 53706). *Fusion Technology;* **10**: No. 3, 734-740(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Crack growth can result in a breech of a pressure boundary causing coolant loss or in total structural failure. This paper discusses brittle and plastic failure in terms of a unified structural model called the Two Criteria model. The model takes into account the flow stress of the material as well as the fracture toughness. Our results indicate that for fusion reactor first wall structures, ferritic steel is better able to resist crack propagation and subsequent structural failure than 316 stainless steel under the same wall loadings and geometry.

17575 **Superconducting magnet radiation effects in fusion reactors.** Sawan, M.E.; Walstrom, P.L. (Univ. of Wisconsin, Fusion Technology Institute, Nuclear Engineering Dept., 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 741-746(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Radiation effects in superconducting magnets of fusion reactors are analyzed and experimental data reviewed. The interaction between the different radiation effects and impact on reactor design is discussed. The need for experimental data with higher irradiation levels is assessed.

17576 **FLiBe-vanadium alloy system corrosion product radiation hazards analysis.** Klein, A.C.; Sze, D.K. (Dept. of Nuclear Engineering, Oregon State Univ., Corvallis, OR 97331). *Fusion Technology;* **10**: No. 3, 747-752(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An assessment is made of the gamma radiation hazards likely to be found near a fusion reactor which employs a vanadium alloy for the blanket and first wall structure, ferritic-steel HT9 for the remainder of the loop and molten salt FliBe as coolant/tritium breeding fluid. Since the radiation levels near the primary loop components are found to be less than 100 mR/hr 3-5 days after shutdown after three years of continuous full power operation, limited hands-on maintenance is conceivable. The very short half-lives of the predominant corrosion products make this result possible and make such a system very attractive.

17577 **Pump limiter experiments and engineering.** Goebel, D.M. (School of Engineering and Applied Science, Center for Plasma Physics and Fusion Engineering, Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 761-769(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Particle removal from tokamak plasmas is essential to achieve density control and some measure of impurity control. This requirement can be satisfied by pump limiters, the present status of which is reviewed here. Modular experiments have recently achieved particle removal rates over 10 torr-l/sec. Studies of impurity removal by pump limiters have demonstrated He and N/sub 2/ (moderate Z) exhaust. Successful modeling of the pump limiter performance using Monte-Carlo neutral gas codes has expanded the understanding of the physics of pump limiters. The heat flux to the surface of limiters in tokamaks has been studied in detail. The rapid

progress in the engineering, theory, and experimental results of pump limiters has led to plans for the application of these devices in new experiments in the next few years.

17578 **Design window for liquid metal-cooled limiters.** Majid, A.; Abdou, M. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 776-781(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A design window for a liquid metal cooled limiter is being sought to establish the viability of the use of liquid metals as coolants for the limiter. The problem is approached by first establishing the constraints, then defining the geometrical configuration and design parameters, and finally, by analyzing a limiter without coating. The maximum allowable heat flux is found to be — 4 MW/m/sup 2/. It can be increased to 5 MW/m/sup 2/ if tapered or insulated feed pipes are used. The presence of coatings required to withstand particle erosion will further reduce the allowable heat flux.

17579 **Fusion surface material melting, ablation and ejection under high heat loading.** Holliday, M.R.; Doster, J.M.; Gilligan, J.G. (Center for Naval Analysis, Alexandria, VA). *Fusion Technology;* **10**: No. 3, 782-788(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Heat Balance Integral Technique is developed to solve for the surface melting and ablation rates when a material is subjected to a high heat flux. Ejection of melt layer material is included in the analysis since external forces (electric and magnetic) are prominent for applications such as fusion plasma disruptions. The Integral Technique has been found to be relatively fast and accurate as compared with finite difference formulations which make it an ideal candidate for inclusion in larger plasma simulation codes. Molten material ejection was determined to dramatically increase surface erosion during a fusion disruption.

17580 **Thermodynamic performance of ceramic tritium breeding blanket material.** Johnson, C.E.; Fischer, A.K. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 985-989(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Thermodynamic calculations are made to compare the thermochemical performance of three candidate breeder blanket materials, Li/sub 2/O, LiAl0/sub 2/, and Li/sub 4/SiO/sub 4/. These calculations are done for the temperature range of 900-1300 K and the oxygen activity range of 10/sup -25/ to 10/sup -5/. Oxygen activity is an influential variable for these materials and must be considered in the diffusion of tritiated species, determining the chemical form of the released tritium, and retention of tritium in the condensed phase. Surface adsorption may also act as a strong contributor to tritium inventory. In general, LiAl0/sub 2/ appears better than Li/sub 2/O and Li/sub 2/O, in turn, appears better than Li/sub 4/SiO/sub 4/.

17581 **The chemistry of molten Li/sub 2/BeF/sub 4/.** Larsen, E.M.; Wittenberg, L.J. (Univ. of Wisconsin, Fusion Technology Institute, Nuclear Engineering Dept., 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 990-994(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The LiF . BeF/sub 2/ system is a potential tritium breeder for a fusion power reactor. The chemical consequences of the TF(HF) generation are examined, particularly reactions proposed for moderating the corrosive properties of TF(HF). The use of molten Li/sub 2/BeF/sub 4/ as a tritium breeding blanket was considered by Grimes and Cantor in 1972. Renewed interest in LiF . BeF/sub 2/ compositions as tritium breeding blankets for MINIMARS (a conceptual design study of a commercial tandem mirror fusion reactor), suggests that a review of the chemical and physical properties of this system is appropriate at this time. A large fraction of the data presented here is derived from the publications of the molten salt breeder (fission) reactor program which prospered at Oak Ridge National Laboratories during the late 1960's and early 1970's. The predictions of chemical reactivity are based on the thermochemical data at 1000 K.

17582 **First wall tile attachment using carbon-carbon composite fittings.** Lutz, G.R.; Tarasen, W.L. (One Space Park, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 1000-1005(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This paper presents unique first wall tile attachment concepts of round or square graphite tiles to an Inconel 625 vacuum vessel (VV) with carbon-carbon (c-c) structural/mechanical elements to satisfy the following objectives: 1. a low profile installation to optimize field efficiency; 2. tile alignment of sufficient precision to fully protect the VV, without adverse interference of the plasma; 3. adequate structural capacity to safely accommodate normal static and dynamic loads as well as disruption and handling loads; 4. a tile and tile shank-to-VV wall stud mechanical interface that provides an acceptable level of conductive heat transfer while accommodating freedom of thermal expansion and contraction; 5. a minimum irradiated life expectancy of 3,000 operating pulses; and 6. a reliable and repeatable method of replacing first wall tiles by means of a conventional remote manipulator device.

17583 **In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures.** Liu, K.C. (Oak Ridge National Lab., Metals and Ceramics Div., Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 1006-1014(Nov 1986). (CONF-860652—). Contract AC05-84OR21400.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Unirradiated Vanstar-7 alloy was tested in fatigue at room temperature, 550°, and 650°C, respectively, in high vacuum below 10/sup -5/ Pa. The test data are analyzed and compared with those of V-15Cr-5Ti and 20% cold-worked type 316 stainless steel tested under the same condition. Results show that the fatigue resistance of Vanstar-7 is in general somewhat lower than that of V-15Cr-5Ti. The low fatigue performance for Vanstar-7 at the elevated temperatures in the high cycle range may be attributable to thermal creep damages because Vanstar-7 is less creep resistant than V-15Cr-5Ti. However, Vanstar-7 exhibits superior fatigue resistance compared with the stainless steel in the low strain range below 0.5% strain.

17584 **Experimental modelling of eddy currents and deflection for tokamak limiters.** Hua, T.Q.; Knott, M.J.; Turner, L.R.; Wehrle, R.B. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 1047-1052(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

During plasma disruptions in a tokamak fusion reactor, eddy currents are induced in the limiters and other conducting structures surrounding the plasma. Interactions between these currents with the toroidal field causes deflection and stress in the structural components. The structural motion in the strong magnetic field induces additional eddy current opposing the initial eddy current and modifying subsequent structural dynamics. Therefore, the motion and current are coupled and must be solved simultaneously. The coupling between current and deflection in cantilevered beams was investigated experimentally. The beams provide a simple model for the limiter blade of a tokamak fusion reactor. Several test pieces and various magnetic field conditions were employed to study the extend of the coupling effect from weak to strong coupling. Experimental results are compared with analytical predictions.

17585 **Conference on thermonuclear reactors.** *Fusion Technology;* **10**: No. 3, 1652(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

This conference presents papers on the design, construction and performance of thermonuclear reactors. Topics considered at the conference included the Compact Ignition Tokamak program, fusion nucleonics experiments, blanket design and evaluation, inertial confinement fusion driver technology, fusion reactor design,

fusion materials (radiation effects and activation), impurity control, liquid metal blankets and magnetohydrodynamic effects, innovative concepts for power conversion, plasma heating, environmental and safety aspects, inertial confinement fusion targets, fusion applications, tritium technology, and fusion economics.

17586 **Demountable toroidal fusion core facility for toroidal physics optimization and fusion engineering research.** Bogart, S.L.; Wagner, C.E.; Krall, N.A.; Sedehi, S.; Weggel, C.F.; Dalessandro, J.A.; Seed, T.J.; Lund, K.O. (EASI, 1104 Camino Del Mar, Del Mar, CA 92014). *Fusion Technology;* **10**: No. 3, 1404-1411(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Demountable Toroidal Fusion Core (DTFC) concept has been analyzed for the Inductively Heated Tokamak (IHT), the Spherical Tokamak (ST), and the Reversed Field Pinch (RFP) for Fusion Engineering Research Facility (FERF) applications. Each of these confinement concepts is viewed as a "core" that is inserted into a surrounding machine envelope including, for example, the outboard toroidal field coil turns, the major poloidal equilibrium coils, blanket and materials testing stations, and a tension-suppression system (precompression) that provides mechanical integrity during the ignition and burn phases. Parametric systems analysis reveals that DTFC FERF operation is possible for all three confinement configurations with the IHT being the most costly and technologically challenging and the RFP being the least costly and, perhaps, least technologically challenging. Future work on the DTFC will be directed toward a Toroidal Physics Optimization Facility.

17587 **Deuterium driven D - T fusion reactor test facility.** Price, R.E.; Shuy, G.W.; Woo, J.T. (U.S. Dept. of Energy, Washington, DC 20545). *Fusion Technology;* **10**: No. 3, 1412-1417(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

In the present scenario for the development of magnetic confinement fusion, the availability of tritium needed to fuel a D-T burning plasma in order to generate 14 MeV neutrons for material and system component testing is not being fully addressed. An alternate approach based on the in situ generation of tritium in a driven D-D reacting plasma is proposed. The feasibility of this approach to attain 14 MeV neutron flux levels comparable with D-T fueled burning plasma from a modest beta, first generation fusion power reactor can be established from known results. A staged scenario, is described in which tritium bred from developmental blankets is used to fuel the system to incrementally raise the neutron wall loading to simulate more advanced fusion reactors.

17588 **Heavy-ion fusion: Future promise and future directions.** Dudziak, D.J.; Saylor, W.W.; Pendergrass, J.H. (Univ. of California, Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1438-1442(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The previous several papers in this heavy-ion fusion special session have described work that has taken place as part of the Heavy-Ion Fusion Systems Assessment (HIFSA) project. Key technical issues in the design and costing of targets, accelerator systems, beam transport, reactor and balance-of-plant, and systems integration have been identified and described. The HIFSA systems model was used to measure the relative value of improvements in physics understanding and technology developments in many different areas. The result of this study has been to, within the limits of our 1986 imagination and creativity, define the "most attractive" future heavy-ion fusion (HIF) power plant at some time in the future (beyond the year 2020 in this case). The project has specifically avoided narrowing the focus to a point facility design; thus, the generic systems modeling capability developed in the process allows for a relative comparison among design options. The authors describe what are thought to be achievable breakthroughs and what the relative significance of the breakthroughs will be, although the specific mechanism for achieving some breakthroughs may not be clear at this point.

17589 **U.S./JAERI calculational benchmarks for nuclear data and codes intercomparison.** Youssef, M.; Jung, J.; Sawan, M.; Nakagawa, M.; Mori, T.; Kosako, K. (Mechanical, Aerospace and Nuclear Engineering, Univ. of California at Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1466-1476(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Four calculational benchmarks were selected by the U.S. and JAERI to compare numerical results based on various transport codes and data bases developed individually by both parties. The benchmarks chosen are fusion-oriented. Data intercomparison were performed with the ENDF/B-IV, ENDF/B-V, and JENDL-3 evaluations. Both deterministic and Monte Carlo methods were used in the codes intercomparison. Among the codes considered are ONEDANT, ANISN-DD, DOT, MORSE, MCNP, and VIM. Results from these intercomparisons are presented in this paper.

17590 **A standard method for economic analyses of inertial confinement fusion power plants.** Meier, W.R. (Lawrence Livermore National Lab., P.O. Box 5508, L-480, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1557-1564(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A standard method for calculating the total capital cost and the cost of electricity for a typical inertial confinement fusion electric power plant has been developed. A standard code of accounts at the two-digit level is given for the factors making up the total capital cost of the power plant. Equations are given for calculating the indirect capital costs, the project contingency, and the time-related costs. Expressions for calculating the fixed charge rate, which is necessary to determine the cost of electricity, are also described. Default parameters are given to define a reference case for comparative economic analyses.

17591 **SAFIRE - A systems analysis code for inertial fusion economics.** McCarville, T.J.; Carson, C.F.; Glasgow, B.B.; Meier, W.R. (TRW, One Space Park, Redondo Beach, CA 90278). *Fusion Technology;* **10**: No. 3, 1565-1570(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A system model for scaling the cost and performance of ICF point designs to different operating conditions has been developed. The model allows changes in various figures of merit to be examined as a function of selected operating conditions. As a result, $/kW/sub e/ can be optimized as a function of net electric output. A detailed description of the algorithms/sup 1/ and users guide/sup 2/ can be obtained through LLNL. This report provides an overview of the philosophy that motivated the performance and cost models, and illustrates the model results with an example.

17592 **Economic comparison of fusion power plant designs.** O'Neill, J.E. (Grumman Aerospace Corp., Bethpage, NY 11714). *Fusion Technology;* **10**: No. 3, 1571-1576(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Cost estimates derived in fusion power plant design studies over the past 10 years are normalized to a common base and compared. It is found that direct costs tend with time toward $1,000/kW/sub e/ and cost of electricity toward 30 mills/kWh, for all reactor types. Costs are in 1980 dollars. Only small reductions in cost are indicated as core mass density increases beyond a value of approximately 100 kW/sub e//Tonne.

17593 **Three-state model for fusion reactor plant availability analysis.** Watanabe, Y.; Maynard, C.W.; Musicki, Z. (Fusion Technology Institute, Univ. of Wisconsin, 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1590-1595(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An availability simulation methodology and a computer program (PROPA) have been developed for systems subject to three

states: normal, degraded, and failed. The program is used to analyze the STARFIRE tokamak fusion reactor plant. The new program extends our modeling capability for complex systems; while it is found that significant improvements are needed in the areas of reliability data, understanding of system behavior, and the computing speed.

17594 **Neutronics analysis for aqueous self-cooled fusion reactor blankets.** Embrechts, M.J.; Varsamis, G.; Jaffa, R.; Steiner, D.; Deutsch, L.; Gierszewski, P. (Rensselaer Polytechnic Institute, Troy, NY 12180). *Fusion Technology;* **10**: No. 3, 1443-1448(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The tritium breeding performance of several Aqueous Self-Cooled Blanket (ASCB) configurations for fusion reactors has been evaluated. The ASCB concept employs small amounts of lithium compound dissolved in light or heavy water to serve as both coolant and breeding medium. The inherent simplicity of this concept allows the development of blankets with minimal technological risk. The tritium breeding performance of the ASCB concept is a critical issue for this family of blankets. Contrary to conventional blanket designs there will be a significant contribution to the tritium breeding ratio (TBR) in the water coolant/breeder of duct shields, and the 3-D TBR will therefore be similar to the 1-D TBR. The tritium breeding performance of an ASCB for a MARS-like tandem mirror reactor and an ASCB based breeding-shield for the Next European Torus (NET) are assessed. Two design options for the MARS-like blanket are discussed. One design employs a vanadium first wall, and zircaloy for the structural material. The trade-offs between light water and heavy water cooling options for this zircaloy blanket are discussed. The second design option for MARS relies on the use of a vanadium alloy as the structural material, and heavy water as the coolant. It is demonstrated that both design options lead to low-activation blankets that allow class C burial. The breeder-shield for NET consists of a water-cooled stainless steel shield.

17595 **Trade-off study of liquid metal self-cooled blankets.** Gohar, Y. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 1449-1455(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A trade-off study of liquid metal self-cooled blankets was carried out to define the performance of these blankets and to determine the potential to operate at the maximum possible values of the performance parameters. The main parameters considered during the course of this study were the tritium breeding ratio (TBR), the blanket energy multiplication factor, the energy fraction lost to the shield, the lithium-6 enrichment in the breeder material, the total blanket thickness, the reflector material selection, and the compositions of the different blanket zones. The primary results of the study are as follows: a) the lithium-lead blanket achieves a higher TBR with a smaller blanket thickness relative to the lithium blanket; b) the lithium blanket generates more energy per fusion neutron relative to the lithium-lead blanket; c) among the possible reflector materials, the carbon reflector produces the highest TBR; d) the high-Z reflector materials (Mo, Cu, W, or steel) generate more energy per fusion neutron and produce smaller TBRs relative to the carbon reflector; e) lithium-6 enrichment is required for the lithium-lead blanket to reduce the total blanket thickness; and f) the energy deposition per fusion neutron reaches a saturation as the blanket thickness, the fraction of the high-Z material in the reflector, or the reflector zone thickness increases (this allows one to design the blanket for a specific TBR without reducing the energy production).

17596 **A thin LiPb/Be helium cooled blanket for MINI-MARS: Neutronics analysis.** El-Guebaly, L.A. (Univ. of Wisconsin, Fusion Technology Institute, Nuclear Engineering Dept., 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1456-1460(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The need for a thin blanket design in fusion reactor provides a driving force to improve the performance of a LiPb-type blanket through adding a moderator to the breeder to soften the neutron spectrum and, thus, enhance the tritium breeding. As a result, the LiPb blanket performed much better with a beryllium moderator and the design of a 0.17 m thick blanket has become feasible.

17597 **Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters.** Sawan, M.E. (Univ. of Wisconsin, Nuclear Engineering Dept., Fusion Technology Institute, 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1483-1488(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Geometrical and spectral differences between inertial confinement fusion (ICF) and magnetic confinement fusion (MCF) facilities lead to significant variation of up to — 60% in peak values and profiles of the time averaged blanket nuclear parameters for the same first wall exposure. Simple scaling of radiation effects with neutron wall loading is inappropriate. These effects together with the temporal effects, that result in — 5 to 8 orders of magnitude higher instantaneous reaction rates in the pulsed ICF reactors, lead to significantly different blanket performances in the ICF and MCF reactor environments.

17598 **Activation analysis of the Compact Ignition Tokamak.** Selcow, E.C. (Fusion Engineering Design Center/Grumman Corp., P.O. Box Y, Oak Ridge, TN 37831). *Fusion Technology;* **10**: No. 3, 1495-1502(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The U.S. fusion program has completed the conceptual design of a compact tokamak device that achieves ignition. The high neutron wall loadings associated with this compact deuterium-tritium-burning device indicate that radiation-related issues may be significant considerations in the overall system design. Sufficient shielding will be required for the radiation protection of both reactor components and personnel. A close-in igloo shield has been designed around the periphery of the tokamak structure to permit personnel access into the test cell after shutdown and limit the total activation of the test cell components. This paper describes the conceptual design of the igloo shield system and discusses the major neutronic concerns related to the design of the Compact Ignition Tokamak.

17599 **Cost study of the ESPRESSO blanket for a tandem mirror reactor.** Raffray, A.R.; Hoffman, M.A.; Gaskins, T. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1577-1582(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A detailed cost study of the ESPRESSO blanket concept for the Tandem Mirror Fusion Reactor has been performed. A computer code was developed to size the magnet, blanket and piping components and to evaluate the central cell contribution to the cost of electricity. The two most promising solid breeder/neutron multiplier configurations were studied: natural lithium oxide as the breeder with no multiplier (Case I), and 30% enriched gamma-lithium aluminate as the breeder with beryllium as the multiplier (Case IV). A design window was obtained for each case based on maximum material temperatures and spacing constraints. The minimum cost designs for Case I and Case IV correspond to 31 and 41 mills/kW-hr for the central cell contribution to the cost of electricity, and to optimum neutron wall loadings of 2.3 and 3.4 MW/m/sup 2/, respectively.

17600 **First wall structural analysis of the aqueous self-cooled blanket concept.** O'Brien, D.A.; Steiner, D.; Embrechts, M.J.; Deutch, L.; Gierszewski, P. (Rensselaer Polytechnic Institute, Troy, NY 12181). *Fusion Technology;* **10**: No. 3, 1611-1616(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A recently proposed blanket concept using water coolant with dissolved lithium compounds for breeding employs water cooled first walls. Water cooled first walls for blankets have also been proposed for some solid breeder blankets. Design options for water cooled first walls are examined in this paper. Four geometries and three materials are analyzed for water coolant at 300°C and 13.8 MPa (2000 psi). Maximum neutron wall loads (with surface heat loads being 25% of neutron wall load) are determined for each geometry and material combination. Of the materials studied, only vanadium alloy is found to be capable of withstanding high wall loads (>10MW/m/sup 2/ neutron and >2.5 MW/m/sup 2/ heat).

17601 **A model for the mechanical interaction between solid breeder and cladding materials.** Orient, G.E.; Ghoniem, N.M. (Mechanical Aerospace and Nuclear Engineering Dept., Univ. of California Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1617-1622(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Mechanical interaction between the solid breeder material and its cladding during power cycles is an important consideration in the design of solid breeder blankets. The analysis presented in the paper gives a design tool for material choices and lifetime prediction for breeder pins. The UCLA solid breeder blanket design is evaluated, and operating conditions are suggested. The material model for the pellet includes linear thermoelastic behavior and swelling. The cladding is assumed to be thin and to exhibit swelling and creep. Two alternate breeder/cladding material pairs have been analyzed, a Li/sub 2/O/2.25Cr-lMo and a LiAlO/sub 2//9-C design. While high swelling excludes the Li/sub 2/O/2.25Cr-lMo design, it is found that in the LiAlO/sub 2//9-C case compatibility of thermal expansion between the breeder and the cladding as well as low swelling of the breeder result in less than 0.5% total plastic strain after one year of operation.

17602 **The bowing of solid breeder rods in a pin-type fusion reactor.** Blanchard, J.P.; Ghoniem, N.M. (Univ. of California at Los Angeles, Los Angeles, CA 90025). *Fusion Technology;* **10**: No. 3, 1623-1627(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The bowing of circular solid breeder pins is studied using standard beam theory. Deformations caused by thermal gradients, swelling gradients, and gravitational forces are included in the investigation and swelling is found to cause the most severe pin bowing. The bowing of Be multiplier rods is found to be insignificant when swelling is not considered. In all cases it is found that adding internal supports can reduce the rod deflections to acceptable levels without increasing the stresses beyond design limits.

17603 **Steady-state and transient thermal hydraulics of a breeder-in-tube blanket design.** Grotz, S.P.; Ghoniem, N.M. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1628-1633(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A new pin-type solid breeder blanket for tokamak reactors has been developed. Detailed engineering analyses have been performed and include configuration, neutronics, structural analysis, tritium transport, materials issues and thermal hydraulics. Steady-state and transient thermal problems have been addressed and are reported. Particular attention is given to the issues of start-up, shutdown and fractional power operation. This study complements a previous report which examined the start-up, shutdown and fractional power operation of a liquid metal cooled tandem mirror reactor blanket.

17604 **Neutronic optimization of a LiAlO/sub 2/ solid breeder blanket.** Levin, P.; Ghoniem, N.M. (Physics Dept., Nuclear Research Center-Negev, P.O. Box 9001, Beer Sheva 84191). *Fusion Technology;* **10**: No. 3, 1634-1639(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

In this paper, a pressurized lobular blanket configuration is neutronically optimized. The blanket configuration features the use of beryllium and LiAlO/sub 2/ solid breeder pins in a helium-cooled cross-flow pattern. One-dimensional neutronic optimization calculations are performed to maximize the tritium breeding ratio (TBR). The procedure involves spatial allocations of Be, LiAlO/sub 2/, 9-C (low-activation ferritic steel), and He, in such a way as to maximize the TBR subject to several material, engineering and geometrical constraints. Consistent with all imposed engineering constraints, a TBR of 1.17 is achieved for a relatively thin blanket (≅43 cm depth).

17605 **Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor.** Raffray, A.R.; Hoffman, M.A. (Mechanical, Aerospace and Nuclear Engineering Dept., Univ. of California, Los Angeles, CA 90024). *Fusion Technology;* **10**: No. 3, 1640-1645(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A thermal-hydraulic design study of the proposed ESPRESSO blanket for the Tandem Mirror Fusion Reactor is presented. Two solid breeder/multiplier configurations have been selected for the study: one with natural Li/sub 2/O as solid breeder and no neutron multiplier and the other with 30% enriched gamma-LiAlO/sub 2/ as solid breeder and Be as multiplier. A systematic procedure has been developed which effectively reduces the number of independent parameters to two, namely the neutron first wall loading and the main flow bulk temperature rise. Their effect on the maximum multiplier and breeder temperatures and on the pumping power ratio is investigated. Maximum allowable breeder and multiplier temperature constraints limit the design choice and a design point has been obtained for each case for a given maximum allowable pumping power ratio.

17606 **High field superconducting magnets (12 T and greater) for fusion applications.** Miller, J.R.; Summers, L.T.; Kerns, J.A. (Lawrence Livermore National Lab., Univ. of California, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1503-1512(Nov 1986). (CONF-860652—). Contract W-7405-ENG-48.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The technology for producing high fields in large superconducting magnets has increased greatly in recent years, but must increase still more in the future. In this paper, the authors examine the present state of the art vis-a-vis the needs of a next-generation fusion machine and outline a program to provide for those needs. They also highlight recent developments that suggest the program goals are within reach.

17607 **MINIMARS choke coil design.** Gurol, H.; Parmer, J.F.; Burgeson, J.E.; Peck, S.D.; Hilal, M.A.; Mancuso, T.A.; Agarwal, K.L.; Dalder, E.N. (General Dynamics Space Systems Div., Mail Zone 92-7100, P.O. Box 85990, San Diego, CA 92138). *Fusion Technology;* **10**: No. 3, 1524-1529(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The purpose of this paper is to discuss the 24 Tesla MINIMARS choke coil configuration. It is a hybrid design consisting of a superconducting background coil and a normal-conducting insert coil. Recent technology advances, use of superalloy reinforcement materials, and current density grading allow the design of coils that are more compact and operate at higher fields than past designs.

17608 **Sliding joint and bond development program for the Alcator C-Mod toroidal field coils.** Beck, W.K.; Becker, H.D.; Besen, M.M.; Gwinn, D.A.; Montgomery, D.B.; Pierce, N.T.; Pillsbury, R.D.; Schultz, J.H. (Plasma Fusion Center, Massachusetts Institute of Technology, NW17-225, Cambridge, MA 02139). *Fusion Technology;* **10**: No. 3, 1536-1541(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Alcator C-Mod toroidal field (TF) magnets include several advanced magnet concepts that are planned or considered for a compact ignition tokamak experiment (C.I.T). Two concepts in particular, sliding joints and explosively-bonded composite plates, require a development program to assure feasibility and performance.

17609 **The differential geometry of twisted coil windings.** Walstrom, P.L. (Univ. of Wisconsin, Nuclear Engineering Dept., Fusion Technology Institute, 1500 Johnson Drive, Madison, WI 53706-1687). *Fusion Technology;* **10**: No. 3, 1542-1547(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The techniques of differential geometry have been applied to the problem of predicting the shape of thick twisted coil windings as successive turns and layers of turns are applied to a winding form. The explicit expressions for the required Christoffel symbols for parallel surfaces are derived in terms of the starting surface parameterization. Expressions for geodesic windings on a particular surface, called the rectifying developable, and the family of surfaces parallel to it are derived. The advantages of the rectifying developable from the point of view of coil fabrication are discussed.

17610 **Stability and vibration of internal windings of superconducting solenoid magnets.** Hara, K.; Moon, F.C. (T.J. Watson Research Center, P.O. Box 218, Yorktown Heights, NY 10598). *Fusion Technology;* **10**: No. 3, 1548-1556(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Superconducting magnets have complex structures. The coil pack is made up of alternate layers of superconductor and insulator, which form an extremely unisotropic composite structure. For example, the MFTF magnet design, the transverse stiffness is quite soft as compared to the circumferential stiffness. In this study, cylindrically wound superconducting magnets were modeled by two-dimensional multi-rings connected by soft springs, and the internal vibration and buckling of the system were studied both experimentally and analytically. Since the linear elastic theory used in the previous studies has failed to predict buckling and vibration of internal turns in the bending mode, elastic ring theory was used in this study. A model based on ring theory and magnet stiffness was developed to explain experimental observations and showed a fair to good agreement between experimental and theoretical values of the buckling current.

17611 **The tritium system for a tokamak with a self-pumped limiter.** Hassanein, A.M.; Sze, D.K. (Argonne National Lab., 9700 South Cass Avenue, FPP-205, Argonne, IL 60439-4837). *Fusion Technology;* **10**: No. 3, 1355-1361(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The self-pumping concept was proposed as a means of simplifying the impurity control system in a fusion reactor. The idea is to remove helium in-situ by trapping in freshly deposited metal surface layers of a limiter or divertor. Trapping material is added to the plasma scrape-off or edge region where it is transported to the wall. Some of the key issues for this concept are the tritium inventory in the trapping material and the permeation of protium and recycling of tritium. These quantities are shown to be acceptable for the reference design. The tritium issues for a helium-cooled solid breeder reactor design with vanadium alloy as a structural material are also examined. Models are presented for tritium permeation and inventory calculation for structure materials with the effect of a thin layer of coating material.

17612 **A process to recover tritium from high pressure helium.** Finn, P.A.; Sze, D.K. (Argonne National Lab., 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* **10**: No. 3, 1362-1366(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A liquid metal absorption system is proposed as a recovery technique for recovering tritium from high pressure helium. The helium and liquid lithium are mixed to effect transfer of the tritium from the gas to the liquid lithium. Subsequently, the lithium is processed using molten salt extraction. The advantages and disadvantages of this method are compared with other methods. Overall, the liquid metal method appears to be one with significant potential.

17613 **Water detritiation for present and future fusion plants.** Rogers, M.L. (Monsanto Research Corp., Mound, Miamisburg, OH 45342). *Fusion Technology;* **10**: No. 3, 1367-1374(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

All fusion reactors that use deuterium-tritide (DT) for fuel will produce tritium-containing water. The quantity and quality (tritium per unit volume) of tritiated water produced depends on several factors. In general, however, the higher the reactor availability the greater the quantity and quality of water produced. This water must be collected and processed to avoid worker exposure and release to the environment. The options for disposition of this water are limited, and in more advanced reactors the tritium contained in water could represent a significant loss to the fuel cycle. The technology currently exists or is being developed to support near term, low availability machines. The technology to support more advanced concepts must be identified and further developed so that it is available when needed.

17614 **Data base for failure/maintenance at the Tritium Systems Test Assembly.** Gruetzmacher, K.M.; Wilhelm, R.C. (Fusion Technology Institute, Univ. of Wisconsin, 1500 Johnson Dr., Madison, WI 53706). *Fusion Technology;* **10**: No. 3, 1596-1604(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A data collection system for obtaining availability/reliability data on fusion technology has been installed at the Tritium Systems Test Assembly (TSTA) of Los Alamos National Laboratory. The system is fashioned after the Centralized Reliability Data Organization developed at Oak Ridge National Laboratory. The data collection system is currently being used at TSTA and is working well. The amount of data that has been collected at TSTA to date is not sufficient to indicate meaningful trends in availability analysis.

17615 **Heavy-ion fusion: Setting the stage.** Herrmannsfeldt, W.B. (Stanford Linear Accelerator Center, Stanford Univ., P.O. Box 4349, Stanford, CA 94305). *Fusion Technology;* **10**: No. 3, 1423(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The purpose of this paper is to establish the context on which the rest of this session will be based. Several papers will report work inspired by the Heavy-Ion Fusion Systems Assessment (HIFSA) Project. This is a small project that is about 2 years old. It is a small fraction of the Heavy-Ion Fusion (HIF) Program, which is itself very small compared to virtually any other fusion effort. Certainly, part of the basis for HIFSA lies in the history of HIF. The program was invented in high-energy physics accelerator laboratories in about 1975. In the past decade, work at several U.S. laboratories and universities, and in Japan and Europe, has resulted in fundamental understanding of the phenomena involved in the stable transport and acceleration of space charge limited beams. HIF is the approach that is, more than any other, most suited to the high energy (multi-megajoule), high repetition rate, and high efficiency required of a power plant driver. There have been seven international conferences devoted to HIF (most recently in May 1986) and numerous independent reviews. All of these confirm the promise of HIF for eventual use for commercial power production. Perhaps the best overall systems study for inertial fusion to date, certainly the best for HIF, is the HIBAll-II study. In this study, the

authors arrive at a power plant scenario in which they project a cost of electricity that is somewhat lower than that found for various magnetic fusion scenarios. Certainly it is competitive with magnetic fusion.

17616 **A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200.** Hovingh, J.; Brady, V.O.; Faltens, A.; Lee, E.P. (Lawrence Livermore National Lab., Box 808, Livermore, CA 94550). *Fusion Technology;* **10**: No. 3, 1424-1426(Nov 1986). (CONF-860652—). Contract AC03-76SF00098.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Optimized cost estimates for induction linac accelerators using mass 133 ions at a charge state of +2 producing inertial fusion target yields of 300, 600, and 1200 MJ are presented. The ions are injected into the accelerator at 3 MV, and accelerated to the required voltage appropriate to the desired target yield. A cost comparison of these drivers is made with drivers using mass 200, charge state +3 ions for several target yields and a fusion power of 3000 MW.

17617 **Gain scaling relations for heavy-ion targets.** Magelssen, G.R. (Los Alamos National Lab., Group X-1, Mail Stop E531, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1427-1428(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The relationship between target gain (thermonuclear energy-released/ion energy incident) and such factors as the total ion energy, the ion beam radius, the ion range, the ion power, the beam geometry, and the released target debris is critical in assessing the feasibility of a particular heavy ion inertial confinement fusion reactor concept. The length of the heavy ion accelerator will depend strongly on the ion particle energy - the ion range. The beam focus and transport both depend on the ion particle energy as does the efficiency of coupling ion energy to the target fuel. Target symmetry requirements determine whether the ion beams are clustered in two arrays for two-sided target illumination or in a symmetric configuration for multisided uniform illumination. The amount of debris energy in charged particles and x-rays impacts chamber design and determines wall loading constraints. The purpose of this paper is to present gain scaling relations that incorporate most of the critical factors.

17618 **Reactor designs for heavy-ion fusion.** Pendergrass, J.H.; Meier, W.R. (Los Alamos National Lab., P.O. Box 1663, Mail Stop F611, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1431-1432(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The Heavy-Ion Fusion Systems Assessment (HIFSA) Project is a study of the prospects for successful pure fusion commercial HIF electric power generation using heavy-ion induction linear accelerator (linac) drivers. Although the project is led by Los Alamos National Laboratory (LANL), success requires substantial contributions from all members of a large interdisciplinary team representing a unique assemblage of talent from other national laboratories, universities, and industry. Recognition that many of the dozens of inertial confinement fusion reactor and balance-of-plant (BOP) concepts developed for laser fusion require only minor modifications for use with induction linac drivers, plus the existence of several concepts developed especially for HIF, led to concentration of limited HIFSA resources on target, accelerator, and integrated-plant issues.

17619 **Heavy ion beam transport in ICF reaction chambers.** Stroud, P. (Univ. of California, Los Alamos National Lab., P.O. Box 1663, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1433-1434(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

An analysis has been performed to determine the technological requirements for transporting a beam of heavy ions across an ICF reaction chamber. This is a crucial issue because excessive beam expansion will reduce the driver energy deposited on the target, and degrade the performance of the reactor system. The physical mechanisms that dominate beam expansion for heavy ion fusion applications include emittance growth, instabilities, parallel momentum spread, and space charge. These mechanisms place technological constraints on such system parameters as beam voltage, beam power, number of beams, beam mass and charge state, final transport length, beam port radius, target radius, beam emittance, momentum tilt, and background chamber gas density. The economic analysis of a heavy ion ICF reactor system requires a thorough understanding of the trade-offs among these parameters imposed by the beam expansion mechanisms.

17620 **A systems performance and cost model for heavy ion fusion.** Zuckerman, D.S.; Driemeyer, D.E.; Waganer, L.M. (McDonnell Douglas Astronautics Co., P.O. Box 513, St. Louis, MO 63166). *Fusion Technology;* **10**: No. 3, 1435-1436(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

As a part of the DOE-sponsored Heavy Ion Fusion Systems Assessment (HIFSA) project, a systems and costing computer model has been developed to examine the behavior of a linear induction accelerator-driven (LINAC) HIF power plant. The main purpose of this code is to examine different system and subsystem options as well as a large range of parameter space in which an HIF power plant might operate. The ultimate goals include the identification of: (1) desirable operating regimes, (2) preferred system and subsystem options, (3) systems with major cost impacts, and (4) systems where appropriate research and development or technological breakthroughs could yield significant economic benefits.

17621 **Heavy ion fusion systems assessment - An overview.** Waganer, L.M.; Driemeyer, D.E.; Zuckerman, D.S.; Billman, K.W. (McDonnell Douglas Astronautics Co., P.O. Box 516, St. Louis, MO 63166). *Fusion Technology;* **10**: No. 3, 1437(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

A study is underway to evaluate the technical performance and economic attractiveness of linear induction-driven Heavy Ion Fusion (HIF) as an energy source for electrical power generation. This study is a cooperative effort of several national laboratories, universities, industrial contractors and the Electric Power Research Institute (EPRI) under the leadership of Los Alamos National Laboratory. McDonnell Douglas Astronautics Company, assisted by Titan Systems, Inc, has the responsibility to integrate the cost and performance models of the driver, reactor and balance of plant systems, evaluate different system options and assess the overall technical and economic performance of an HIF power plant. Individual system options have been designed and analyzed by the other participants in the DOE-sponsored parent study and are provided for system integration and evaluation. This paper describes the integration and evaluation effort for the HIF Systems Assessment. Specific areas discussed include, the definition of Systems Requirements, the development of Assessment Methodology, the characterization of System Options, the description of Systems Assessment Code, the assessment of Code Results, the ranking of System Options, the selection of Attractive System Options, and the determination of Preferred Operating Parameter Space. The initial study effort was to define the system requirements from the standpoint of the overall power plant. This was accomplished by establishing overall power plant performance goals and specifications. The plant was assumed to be dedicated only to electrical power production in the 2020 time frame enabling the study to look beyond developmental and startup difficulties. The net plant output was defined to be between 400 and 1500 MWe which would allow investigating the effect of plant size.

17622 **COVFILS-2: Neutron data and covariances for sensitivity and uncertainty analysis.** Muir, D.W. (Los Alamos National Lab., Applied Nuclear Science Group, Mail Stop B243, Los Alamos, NM 87545). *Fusion Technology;* **10**: No. 3, 1461-1465(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

The authors have prepared a new, fusion-oriented library of multigroup neutron cross sections, scattering matrices, and covariances (uncertainties and correlations) using modules of the NJOY nuclear data processing system. This 74-group library, called COVFILS-2, was produced specifically for use in the sensitivity and uncertainty analysis of fusion-relevant integral experiments. The 14 materials included in the first version of COVFILS-2 are H, /sup 6/Li, /sup 7/Li, Be, C, N, O, Na, Al, Si, Cr, Fe, Ni, and Pb.

17623 **Fast and intermediate energy neutron albedos for fusion materials.** Micklich, B.J. (Dept. of Nuclear Engineering, Univ. of Illinois at Urbana-Champaign, 103 S. Goodwin Avenue, Urbana, IL 61801). *Fusion Technology;* **10**: No. 3, 1477-1482(Nov 1986). (CONF-860652—).

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Neutron albedo methods can be used to simplify transport calculations in a wide variety of applications. Their utilization requires a collection of albedo data and a model which makes these results convenient for hand or machine computation. Results are presented from neutron albedo calculations for incident intermediate-energy neutrons. These results can be explained using our knowledge of neutron interaction physics. Total albedos are directly related to the cross sections for elastic scatter and absorption. Angular distributions of reflected neutrons are approximately cosθ/ sub r/ for all incident neutron conditions. The total albedo results are well modeled by an extension of a previously developed fast-neutron albedo model when Σ/sub abs//Σ/sub t/ (the ratio of absorption to total cross section) is small.

17624 **Supercomputers and magnetic fusion energy.** Nelson, D.B. (U.S. Dept. of Energy, Washington, DC 20545). pp 239-257 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

Fusion research has its own fascination and its own complexity. In fact, development of controlled fusion energy has been called the most complex technical task ever undertaken by mankind. Statements of that sort are always debatable, but fusion certainly is complex. This paper covers five topics: (1) what controlled fusion is, (2) why computing is important to fusion research, (3) contributions to fusion research from supercomputer use, (4) how supercomputers are actually used, and (5) remaining problems and opportunities and a glimpse into the future.

17625 **Fusion power: One answer to U.S. energy needs in the 21st century.** Kulcinski, G.L.; Conn, R.W.; Cameron, E.N.; Sviatoslavsky, I. (Fusion Engineering Program, Nuclear Engineering Dept., Univ. of Wisconsin, Madison, WI 53706). pp 280-333 of Energy: Four ourselves and our posterity. Perrine, R.L.; Ernst, W.G. Old Tappan, NJ; Prentice Hall Inc. (1985).

The current status of fusion power research and the perception of a fusion power economy is reviewed as of early 1980. It is concluded that considerable progress has been made in the past 20 years and that by the late 1980s the achievement of energy "break even" could propel scientists into the commercialization stage of fusion research. Several fusion reactor designs have been reviewed and the common features used to develop an environmental and safety assessment of fusion versus other forms of energy available in the 21st century. With the existing knowledge as of 1980, it was concluded that fusion power plants will represent a muc' smaller environmental and safety hazard than coal or fission reactor plants even though fusion plants might be somewhat more expensive. Since this paper was written, events in the scientific community have reinforced the foregoing conclusions, and efforts are now under way to reduce even more the hazards discussed herein.

17626 **The fusion-fission hybrid.** Teller, E. (Hoover Institution on War, Revolution and Peace, Stanford, CA 94305). pp 272-279 of Energy: Four ourselves and our posterity. Perrine, R.L.; Ernst, W.G. Old Tappan, NJ; Prentice Hall Inc. (1985).

As the history of the development of fusion energy shows, a sustained controlled fusion reaction is much more difficult to produce than rapid uncontrolled release of fusion energy. Currently, the "magnetic bottle" technique shows sufficient progress that it might applied for the commercial fuel production of /sup 233/U, suitable for use in fission reactors, by developing a fusion-fission hybrid. Such a device would consist of a fusion chamber core surrounded by a region containing cladded uranium pellets cooled by helium, with lithium salts also present to produce tritium to refuel the fusion process. Successful development of this hybrid might be possible within 10 y, and would provide both experience and funds for further development of controlled fusion energy.

17627 **Structural materials for fusion reactor blanket systems.** Bloom, E.E.; Smith, D.L. (Oak Ridge National Lab., Oak Ridge, TN 37831). pp 253-262 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—). Contract AC05-84OR21400.

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

The blanket is one of the largest and most complex systems in a fusion power reactor. The primary functions of the blanket systems are recovery of heat produced in the plasma and breeding of tritium for the reactor fuel cycle. Performance of the blanket in terms of thermodynamic efficiency of the power conversion cycle, reliability, tritium breeding and lifetime of the system will be major factors in determining the cost of electricity from a fusion power reactor. Numerous possibilities exist from which a compatible combination of blanket structural material, coolant, and breeding media must be selected. It is not possible at this time to establish which combination is optimum. Significantly more information will be required on the performance of materials, particularly the structural material and breeding media, before this can be accomplished. If one selects a structural material then the choice of breeding media and coolant is constrained and limits can be placed on the maximum temperature of the structural material.

17628 **Tritium breeding materials.** Hollenberg, G.W.; Johnson, C.E.; Abdou, M.A. (Westinghouse Hanford Co., Richland, WA). pp 265-273 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

An indisputable need of D-T fusion power remains the identification of a reliable, safe and functional material which efficiently breeds tritium. Although two material classes - solid and liquid breeder material - have been used as the basis for reasonable blanket concepts, critical issues and uncertainty still remain for both. Liquid lithium is fraught mainly with safety (reactivity) concerns, but MHD effects remain a critical issue. Although lithium lead alloys are not as reactive with oxygen, the corrosion of structural materials by Li/sub 17/Pb/sub 83/ and the tritium permeation pose a separate class of risks. The inherent chemical stability of ceramic oxides stimulates the search for solid breeder materials unencumbered by these safety issues. But the accessibility of tritium generated in these materials and the ability to adequately generate tritium are questions which require early answers. In addition, lifetime limiting issues such as lithium transport and swelling, may decide the fate of the otherwise favored Li/sub 2/O, or may not enter in at all.

17629 **Ceramics for fusion devices.** Clinard, F.W. Jr. (Los Alamos National Lab., Los Alamos, NM). pp 276-282 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Ceramics are required for a number of applications in fusion devices, among the most critical of which are magnetic coil insulators, windows for RF heating systems, and structural uses. Radiation effects dominate consideration of candidate materials, although good pre-irradiation properties are a requisite. Materials and components can be optimized by careful control of chemical and microstructural content, and application of brittle material design and testing techniques. Future directions for research and development should include further extension of the data base in the areas of electrical, structural, and thermal properties; establishment of a

fission neutron/fusion neutron correlation including transmutation gas effects; and development of new materials tailored to meet the specific needs of fusion reactors.

17630 **Plasma-material interactions.** Wilson, K.L. (Sandia National Labs., Livermore, CA 94550). pp 243-250 of Materials for future energy systems. Metals Park, OH; American Society for Metals (1984). (CONF-840570—).

From American Society for Metals materials for future energy systems conference; Washington, DC, USA (1 May 1984).

Plasma-interactive components must be resistant to erosion processes, efficient in heat removal, and effective in minimizing tritium inventory and permeation. As long as plasma edge temperatures are 50 eV, no one material can satisfy the diverse requirements imposed by these plasma materials interactions. The only solution is the design of duplex, or even more complicated, structures. The material that faces the plasma should be low atomic number, with acceptable erosion and evaporation characteristics. The substrate material must have high thermal conductivity for heat removal. Finally, materials must be selected judiciously for tritium compatibility. In conclusion, materials play a critical role in the achievement of safe and economical magnetic fusion energy. Improvements in materials have already led to many advances in present day device operation, but additional innovative materials solutions are required for the critical plasma materials interaction issues in future power reactors.

99 GENERAL AND MISCELLANEOUS

REFER ALSO TO CITATION(S) 17069

17631 **(PNL-SA—14407) Hanford defense mission: Past, present and future.** Munson, L.F. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1986. Contract AC06-76RL01830. 8p. (CONF-8611122—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE87002709.

From Monthly meeting of San Juan Island Chapter of the Daughters of the American Revolution; Friday Harbor, WA, USA (11 Nov 1986).

This paper describes the origin of Hanford, and its role in the Manhattan Project, its current role, and what is seen for Hanford in the future. Emphasis is on Hanford's defense mission. However, Hanford is a national resource in a number of areas and some of these are mentioned as well.

17632 **(UCRL—95532) Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative.** Wood, L.L. (Lawrence Livermore National Lab., CA (USA)). Oct 1986. Contract W-7405-ENG-48. 18p. (CONF-8610212—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87003884.

From Strategic defense: commercial applications and political-economic implications conference; Kiel, F.R. Germany (17 Oct 1986).

While the details of Nitze Criteria-satisfying architectures for defense against strategic attack with ballistic missiles are still being worked out, it is already clear that quite advanced sensors, telecommunications and data processing technologies will be features of all of them. It is concluded that the SDI, due to its institutional youthfulness, its charter for large-scale research and its self-evident need for such technologies, is likely to dominate many aspects of these technology development areas during the next two decades, especially if it continues more-or-less as the current American Administration contemplates. Both the technical and the economic aspects of data-gathering and manipulation seem likely to be substantially enhanced, due to the existence of the SDI.

9901 Management

REFER ALSO TO CITATION(S) 15266, 17195

17633 **(DOE/BC/10828—2) A stochastic approach to project planning in an R and D environment: Final report.** Seyedghasemipour, S.J. (East Carolina Univ., Greenville, NC (USA). Dept. of Mathematics). Feb 1987. Contract AS19-84BC10828. 105p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87005347.

This study describes a simulation approach to project planning in an R & D environment by network model. GERT (Graphical Evaluation and Review Technique), a network model, was utilized for the modeling of a hypothetical research and development project. GERT is a network model capable of including randomness in activity duration, probabilistic branching, feedback loop, and multiple terminate node in a project planning. These capabilities make it more suitable for modeling of research and development projects than the previous approaches such as CPM and PERT. SLAM II simulation language is utilized for simulation of the network model. SLAM II is a simulation language which heavily relies on GASP IV and Q-GERTS with powerful modeling capability in a single integrated framework. The simulation is performed on a hypothetical "standard" research and development project. Two cases of project planning are considered. In the first case, the traditional simulation of network model of the hypothetical R & D project is performed. In the second case, learning factor is incorporated in the simulation process. Learning factor, in the context of project planning, means the mean and variance of a probability distribution representing an activity duration is discounted (reduced) every time that activity is repeated. The results and statistics of each case study concerning expected duration of successful completion of the project, probability of washouts, and realization time of milestones are presented in details. The differences between two cases (i.e., with and without learning factor) are discussed. 19 refs.

17634 **(DOE/MA—0269) Annual report to Congress on competition, FY 1986.** (USDOE Assistant Secretary for Management and Administration, Washington, DC. Directorate of Procurement and Assistance Management; USDOE Assistant Secretary for Management and Administration, Washington, DC. Agency Competition Advocate). Jan 1987. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005591.

This report comprises the Department of Energy's (DOE's) second annual report to the Congress as required by Public Law 98-369, the Competition in Contracting Act of 1984 (CICA). The fiscal year (FY) 1986 activities and accomplishments of the Department to increase competition in acquisition contracts are covered in this report along with the goals and plans for FY 1987.

17635 **(INIS-mf—10317) GRS annual report 1985.** (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). 1985. 93p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE87750512.

The report summarizes the tasks and objectives of the GRS and gives an account of the activities in the year under review, including a report of the managing board and the organizational tree. The various projects performed and activities accompanying research work are discussed in detail. Information is given on activities in cooperation with foreign organisations, and on publications and conference papers by members of the GRS.

17636 **(INIS-mf—10528) Annual report 1985-1986 [of the Department of Atomic Energy of the Government of India].** (Department of Atomic Energy, Bombay (India)). 1986. 91p. NTIS (US Sales Only), PC A05/MF A01. File Number DE87701296.

The performance and activities during the financial year 1985-1986 of the Department of Atomic Energy (DAE), India and its various units are reported. The various units of the DAE can broadly be categorised into groups: research establishments, production units and public sector undertakings. After taking a general survey, the detailed report is presented under the chapters entitled:

(1) nuclear power, (2) research and development, (3) Atomic Energy Regulatory Board, (4) public sector undertakings, and (5) other activities. Some of the other activities include international relations in the field of nuclear energy, information services, organization of training courses to meet the requirements of programmes of the DAE, technology transfer, financial support to institutions and universities for research in nucler science, and sponsoring of conferences, symposia etc. in the field of nuclear science and its applications. Major achievements of the DAE during the report period are: (1) attainment of criticality by the indigenously designed and built 100 MWt research reactor DHRUVA at Trombay, Bombay, (2) attainment of criticality by the Fast Breeder Test Reactor at Kalpakkam, (3) commissioning of the second unit of the Madras Atomic Power Station and its subsequent synchronisation with the power grid, (4) commissioning of the vitrification plant for management of high level radioactive wastes at Tarapur, and (5) successful testing of a 5 mwt MHD pilot at Tiruchirapalli.

17637 **(INIS-mf—10553(Vol.1)) Safety work organization in nuclear power plant. A9. Volume 1.** (Jaderna Elektrarna, Dukovany (Czechoslovakia)). 1985. 143p. (In Czech). NTIS (US Sales Only), PC A07/MF A01. File Number DE87700733.

Safety at work specifications.

The first volume defines the duties of both the organization and personnel as concerns work safety and health in the Dukovany nuclear power plant, and describes the methods. (J.P.).

17638 **(INIS-mf—10553(Vol.2)) Safety work organization in nuclear power plant. A9. Volume 2. Annexes.** (Jaderna Elektrarna, Dukovany (Czechoslovakia)). 1985. 107p. (In Czech). NTIS (US Sales Only), PC A06/MF A01. File Number DE87700734.

The second volume provides the laws, directives, major standards, principles, lists of selected workplaces where woman work is prohibited, instructions for new personnel, general principles of workplace safety, reports and provisions by commissions for reporting accidents and injuries, recourses, etc. (J.P.).

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 15925, 15995, 17624

17639 **(AD-A—173730/3/XAB) Toward efficient implementations of PCCG (preconditioned conjugate gradient) methods on vector supercomputers. Technical report.** Melhem. (Pittsburgh Univ., PA (USA). Inst. for Computational Mathematics and Applications). Oct 1986. 37p. (ICMA—86-101). NTIS, PC A03/MF A01.

Large, sparse linear systems that result from the discretization of partial differential equations on regular and irregular domains are considered, and focus is on application of the preconditioned conjugate gradient (PCCG) method to the solution of such systems. More specifically, the goal of this paper is the efficient implementation of the PCCG method on vector supercomputers. The contribution to the above goal is made by 1) introduction of a data structure that way be effectively manipulated on vector machines, 2) utilization of preconditioning matrices which are obtained by incomplete factorization with diagonal update sets, and 3) introduction of new numbering schemes for both regular and irregular grids.

17640 **(ANL—86-51) Deriving properties of systems from properties of parts and lists of connections.** Gabriel, J.R.; Chapman, R.O. (Argonne National Lab., IL (USA)). Dec 1986. Contract W-31109-ENG-38. 25p. NTIS, PC A02/MF A01; GPO Dep. File Number DE87005587.

This paper presents an algorithm in PROLOG for compiling recursively computable descriptions of system behavior from computable descriptions of behavior for parts and lists of interconnections. We give a set of conditions that must be satisfied by various data structures in the computation. It seems possible to provide an informal verification (by hand) that these conditions are true also of the output. 7 refs.

17641 **(CONF-861096—3) Representational issues in machine learning.** Liepins, G.E.; Hilliard, M.R. (Oak Ridge National Lab., TN (USA)). 25 Oct 1986. Contract AC05-84OR21400. 12p. NTIS, PC A02. File Number DE87004617.

From International symposium on methodologies for intelligent systems; Knoxville, TN, USA (22 Oct 1986).

Classifier systems are numeric machine learning systems. They are machine counterparts to the natural genetic process and learn by reproduction, crossover, and mutation. Much publicity has been attended to their ability to demonstrate significant learning from a random start and without human intervention. Less well publicized is the considerable care that must be given to the choices of parameter settings and representation. Without the proper "nurturing environment" genetic algorithms are apt to learn very little. This infusion of human intelligence is often discounted, but the choice of appropriate representation forms the core of much of the current genetic algorithm research. This paper will address some of the representational issues from the perspective of two current experiments, one with scheduling and the other with a simulated robot. 10 refs., 7 figs.

17642 **(CONF-870355—3) How to set up a successful production graphics facility.** Riley, B.A.; Johnston, R.B. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA); Oak Ridge National Lab., TN (USA)). 1987. Contract AC05-84OR21400. 7p. NTIS, PC A02. File Number DE87005509.

From Computer graphics '87 conference; Philadelphia, PA, USA (22 Mar 1987).

The Graphic Arts Department (GAD) of Oak Ridge National Laboratory (ORNL) has been using computer graphics for production work since 1979. The computer graphics project has from its beginning been evaluated for production suitability based on cost justification. As the system has evolved, the complexity of production work has increased, and various means have been used to enhance productivity. The paper will discuss the physical requirements of a production system and managerial considerations for operation of such a system.

17643 **(CONF-8506333—1) Automated reasoning and knowledge base design in the scientific programming environment.** Lusk, E.L.; Overbeek, R.A. (Argonne National Lab., IL (USA)). 17 Jun 1985. Contract W-31109-ENG-38. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87001558.

From IFIP WG 2.5 working conference on problem solving environments for scientific computing; Sophia Antipolis, France (17 Jun 1985).

Intelligent aids to the development of scientific software are in great demand but in short supply. Two key components of such expert systems will be automated reasoning and knowledge representation methodologies. First order logic is described as the common language of a class of reasoning systems and database design methods. An overview is given of reasoning paradigms used in current expert systems and of database design methods appropriate to creation of the knowledge base to support such reasoning. Finally, some of the problems seen as topics for further research in this area are described. 14 refs.

17644 **(CONF-8610218—1) Toward formal analysis of ultra-reliable computers: A total systems approach.** Chisholm, G.H.; Kljaich, J.; Smith, B.T.; Wojcik, A.S. (Argonne National Lab., IL (USA); Michigan State Univ., East Lansing (USA). Dept. of Computer Science). 1986. Contract W-31109-ENG-38. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004817.

From 7. Digital Avionics Systems Conference (DASC); Fort Worth, TX, USA (13 Oct 1986).

This paper describes the application of modeling and analysis techniques to software that is designed to execute on four channel version of the the Charles Stark Draper Laboratory (CSDL) Fault-Tolerant Processor, referred to as the Draper FTP. The software performs sensor validation of four independent measures (singlas) from the primary pumps of the Experimental Breeder Reactor-II operated by Argonne National Laboratory-West, and from the vali-

dated signals formulates a flow trip signal for the reactor safety system. 11 refs., 4 figs.

17645 (DOE/ER/25009—290B) Caltech Concurrent Computation Program: Annual report, 1985-86. Fox, G.C. (California Inst. of Tech., Pasadena (USA)). 13 Oct 1986. Contract FG03-85ER25009;AC03-81ER40050. 34p. (CALT—68-1404). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005035.

This report describes the current status of the Caltech Concurrent Computation Program (C^3P), which is a major effort at both the Caltech campus and JPL (Jet Propulsion Laboratory). The major goal of the program is to develop the capability of concurrent processors for general purpose computation with special emphasis on science and engineering. An important feature of the approach is that the members of the project are scientists who lead in the use of computational techniques in their respective research fields, and have already developed state-of-the-art programs on sequential machines. The project currently includes researchers in applied mathematics, aerodynamics, astrophysics, biology, chemistry, computer science, condensed matter, earthquake engineering, geophysics, high energy physics, plasma physics, molecular dynamics, nuclear physics, image processing, and structural mechanics. 2 figs.

17646 (DOE/ER/25009—378) CUBIX: Programming hypercubes without programming hosts. Salmon, J. (California Inst. of Tech., Pasadena (USA). Dept. of Physics). 1986. Contract FG03-85ER25009. 8p. (CONF-8609173—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87005030.

From 2. conference on hypercube multiprocessors; Knoxville, TN, USA (29 Sep 1986).

Typically, application programs for hypercubes consist of two parts, a master process running on the host and a server running in the nodes of the hypercube. CUBIX adopts a different viewpoint. Once a program is loaded into the hypercube, that program assumes control of the machine. The host process only serves requests for operating system services. Since it is no more than a file server, the host program is universal; it is unchanged from one application to the next. This programming model has some important advantages; (1) program development is easier because it is not necessary to write a separate program for the host, (2) hypercube programs are easier to develop and debug because they can use standard I/O routines, rather than machine dependent system calls, (3) hypercube programs can often be run on sequential machines with minimal modification, (4) versions of CUBIX exist for both crystalline and amorphous applications. In crystalline applications operating system requests occur synchronously. Requests are either "singular" or "multiple", according to whether all nodes request the same or distinct actions. In amorphous applications requests occur completely asynchronously. The host process serves each request independently. Care is taken so that many processors may simultaneously access the same file.

17647 (DOE/JPL—1012-115) The SIMRAND I computer program: Simulation of research and development projects. Miles, R.F. Jr. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Feb 1986. Contract AI01-85CE89008. 77p. (JPL-PUB—85-96). NTIS, PC A05/MF A01; GPO Dep. File Number DE87005420.

SIMulation of Research ANd Development Projects (SIMRAND) is a methodology for the selection of the optimal subset of system or tasks to be implemented on a research and development (R & D) project. The SIMRAND methodology models the alternative subsets of systems or tasks under consideration with alternative networks. Each path through an alternative network represents one way of satisfying the project goals. Equations are developed that relate the system or task variables to the measure of preference. Uncertainty is incorporated by treating the variables of the equations probabilistically as random variables, with associated cumulative distribution functions. Cardinal utility functions are assessed over the measure of preference. The SIMRAND I Computer Program is run for each alternative network, incorporating the network structure, the equations, the cumulative distribution functions, and the utility functions in a Monte Carlo simulation model. The alternative network yielding the most-preferred value for the measure of preference, or the highest utility function value, is the optimal network. This Report documents the SIMRAND I Computer Program (Version 5.0 x 03) written in Microsoft FORTRAN for the IBM PC microcomputer and its compatibles. The SIMRAND I Computer Program comprises eleven modules - a main routine and ten subroutines. Two additional files are used at compile time, one inserts the system or task equations into the source code, while the other inserts the dimension statements and common blocks. The SIMRAND I Computer Program can be run on most microcomputers or mainframe computers with only minor modifications to the computer code.

17648 (DP-MS—86-137) Using vision systems when bar code won't work. Leader, D.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jan 1987. Contract AC09-76SR00001. 13p. (CONF-870371—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE87004514.

From ID EXPO meeting; Long Beach, CA, USA (25 Mar 1987).

The Optical Character Reader Vision System is reviewed. Performance characteristics of this system are outlined and compared to bar code reading systems.

17649 (JINR—R-10-85-333) DECAN program for determining parameters of exponential distributions in experiments on the genetically linked radionuclide investigation. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1985. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701337.

The method and algorithm are given intended to solve the problem of determining parameters of complex exponential distributions, which describe the genetically linked decays of radionuclides under conditions of poor statistics and informational data inadequacy. The DECAN program which realizes the method is described. 4 refs.; 2 figs.

17650 (JINR-R—11-85-757) Application of quasi-random numbers for simulation. Kazachenko, O.N.; Takhtamyshev, G.G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1985. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700810.

Application of the Monte-Carlo method for multidimensional integration is discussed. The main goal is to check the statement that the application of quasi-random numbers instead of regular pseudo-random numbers provides more rapid convergency. The Sobol, Richtmayer and Halton algorithms of quasi-random sequences are described. Over 50 tests to compare these quasi-random numbers as well as pseudo-random numbers were fulfilled. In all cases quasi-random numbers have clearly demonstrated a more rapid convergency as compared with pseudo-random ones. Positive test results on quasi-random trend in Monte-Carlo method seem very promising. 11 refs.; 5 figs.

17651 (KFK—4099) Principles and techniques of data evaluation. Froehner, F.H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Aug 1986. 40p. NTIS (US Sales Only), PC A03/MF A01. File Number DE87750521.

The probabilistic foundations of data evaluations are reviewed, with special emphasis on parameter estimation based on Bayes' theorem and modern methods concerning prior probabilities. The process leading from raw data to evaluated data files is briefly explained for the example of nuclear reaction cross sections, with a discussion of systematic and statistical errors and their propagation. It is shown how evaluators can establish data covariances if error components are properly specified by experimentalists, and how correlated data uncertainties in covariance files are utilised in sensitivity studies and accuracy assessments. The problem of inconsistent data is also addressed briefly.

17652 **(KIYI—85-6) Representation on flow information systems with Petri nets use.** Patlan', Yu.V. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 22p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. File Number DE87700827.

Representation of automatic systems with flow character of data processing with Petri nets use is described. The base elements and operation with them are defined for the flow nets. The application of flow model for software development is considered. 11 refs.; 3 figs.

17653 **(KIYI—85-32) POMNK-programme of experimental data approximation by linear combination of functions.** Sokolov, A.M. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1986. 40p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. File Number DE87700838.

In paper the methods of problem solution of experimental data approximation comprising the faults, by linear combination of basic functions. Particular emphasis is given to the problem of stability and the estimation of result precision. The instructions on application and the programme codes are given. Produced software are oriented to the PDP computer. 16 refs.

17654 **(ORNL/CSD/TM—240) Upgrade of the GRESS (test version D) precompiler to allow triply-dimensioned arrays.** Horwedel, J.E.; Pin, F.G. (Oak Ridge National Lab., TN (USA)). Dec 1986. Contract AC05-84OR21400. 35p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE87005286.

GRESS is a FORTRAN precompiler and run time library which automatically processes computer models and adds derivative-taking capabilities to the normal calculated results. The GRESS system is under development at ORNL and work is proceeding in upgrading test versions of the precompiler to allow processing by GRESS of most of the ANSI X3.9-1978 FORTRAN syntax. Heretofore, a major limitation has been the inability of GRESS to process arrays with more than two dimensions. Consequently, a significant amount of human effort was required to convert three- and higher-dimensional arrays into two-dimensional arrays for processing with GRESS. This report describes the addition of ten operation codes to the GRESS precompiler and run time library to allow application to FORTRAN programs with three-dimensional arrays. The new operation codes were tested on a sample problem. A comparison of CPU time is made for sample problems run on a VAX 8600 computer with one-, two-, and three-dimensional arrays. It is recommended that GRESS be further modified to accommodate higher-dimensional arrays up to the ANSI X3.9-1978 limit of seven dimensions.

17655 **(ORNL/TM—10038) On the use of CORLIB subroutines for the solution of a model fluid flow problem.** Thompson, S. (Oak Ridge National Lab., TN (USA)). Dec 1986. Contract AC05-84OR21400. 58p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005285.

This report describes the use of several subroutines from the CORLIB core mathematical subroutine library for the solution of a model fluid flow problem. The model consists of the Euler partial differential equations. The equations are spatially discretized using the method of pseudo-characteristics. The resulting system of ordinary differential equations is then integrated using the method of lines. The stiff ordinary differential equation solver LSODE (2) from CORLIB is used to perform the time integration. The non-stiff solver ODE (4) is used to perform a related integration. The linear equation solver subroutines DECOMP and SOLVE are used to solve linear systems whose solutions are required in the calculation of the time derivatives. The monotone cubic spline interpolation subroutines PCHIM and PCHFE are used to approximate water properties. The report describes the use of each of these subroutines in detail. It illustrates the manner in which modules from a standard mathematical software library such as CORLIB can be used as building blocks in the solution of complex problems of practical interest. 9 refs., 2 figs., 4 tabs.

17656 **(PNL-SA—14017) Managing the data analysis process.** Cowley, P.J.; Carr, D.B.; Nicholson, W.L. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1986. Contract AC06-76RL01830. 7p. (CONF-860751—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE87004129.

From 3. international workshop on statistical and scientific database management; Luxembourg, Luxembourg (22 Jul 1986).

Data analysis management is a methodology for increasing the productivity of the data analyst by providing automated tools for the capture, management, and restoration of information generated during a computer-assisted data analysis. We have developed a prototype system that allows the analyst to manage the data analysis process by designating points in the analysis at which the components of computation, data structures, and analyst understanding are captured for later use. 8 refs., 3 figs.

17657 **(UCID—20664-86) Computer science research: Computation directorate.** McGraw, J.R.; Grupe, K.F. (Lawrence Livermore National Lab., CA (USA)). 1987. Contract W-7405-ENG-48. 114p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE87005198.

This second annual report highlights research activities in computer science and numerical analysis carried out within the Computation Directorate of the Lawrence Livermore National Laboratory (LLNL). Its purpose is to provide a technical introduction to current areas of study and to report on recent progress. Research features a heavy emphasis on multiprocessing. Although multiprocessing plays a major role in nearly every proposed new supercomputer system, much work needs to be done before we can understand how to use it effectively. In addition to multiprocessing studies, strong efforts are continuing in some of the more traditional areas of computer science, particularly numerical methods.

17658 **(UCID—20946) Micro-to-Mainframe Communication Standard: Subsystem design analysis report.** Burgher, L.M.; Sharpe, N.; Prassinos, P. (Control Data Corp., Pleasanton, CA (USA); Lawrence Livermore National Lab., CA (USA)). Sep 1986. Contract W-7405-ENG-48. 64p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE87005200.

This report documents the work performed in the implementation of the micro-to-mainframe (MMCS) project. It describes the methodology used in the technical evaluation towards achieving the MMCS results. It also identifies the source materials used in collecting the technical data. Finally, it reports the analysis results of the evaluation work performed.

17659 **(UCRL—95652) A diffusion operator for Lagrangian meshes.** Margolin, L.G.; Tarwater, A.E. (Lawrence Livermore National Lab., CA (USA)). Nov 1986. Contract W-7405-ENG-48. 15p. (CONF-8611115—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE87003520.

From Nuclear explosives code development conference; Albuquerque, NM, USA (17 Nov 1986).

A new diffusion operator for a Lagrangian mesh of irregular quadrilaterals is described. The operator diffuses cell-centered quantities and differs from previous works both in construction and in its form. The diffusion operator is constructed by requiring it to exactly reproduce certain properties of the physical operator. These properties are conservation, self-adjointness and the ability to exactly capture quadratic yields. These properties are expressed as a system of linear equations whose solution fields the coefficients of the operator. 6 refs., 8 figs.

17660 (ZfI-Mitt—109, pp 27-66) **Computer codes for treatment of highly excited atomic states.** Lorenz, M.; Hartmann, E. Dec 1985. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE87780054.

In Report of the Central Institute for Isotope and Radiation Research.

This paper is intended to describe several computer codes for treating some excitation modes, the intraatomic relaxation and the deexcitation of atomic states carrying single or multiple vacancies. By considering the relevant multiplet effects in open shells an assessment is made of the applicability to radiative and non-radi-

ative deexcitation. Although being concise this methodical survey provides all the necessary information (including input descriptions) for exploiting the programm system for purposes within its scope.

17661 **A compiler-assisted cache coherence solution for multiprocessors.** Veidenbaum, A.V. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 1029-1036 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

The existing solutions to multiprocessor cache coherence problem are not suitable, in the authors' opinion, for systems with a large number of processors. They propose a new solution in which a compiler generates cache management instructions. Conditions necessary for cache coherence violation are defined. The structure of a program and its dependence graph are used to detect when these conditions become true, and the instructions to enforce coherence are generated. No communication between processors is required at run-time to enforce coherence. The correctness of the solution is proved.

17662 **Speedup bounds and processor allocation for parallel programs on multiprocessors.** Polychronopoulos, C.D.; Banerjee, V. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 961-968 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

The main aim of this paper is to study allocation of processors to parallel programs executing on a multiprocessor system, and the resulting speedups. The authors first consider a general program represented as a sequence of steps consisting of parallel operations, then one represented as a task graph whose nodes are do across loops and whose edges represent precedence constraints, and finally a single do across loop. General bounds on program speedup are discussed and measurements of code parallelism for the LINPACK numerical package are presented.

17663 **Vector processing on the Alliant FX/8 multiprocessor.** Abu-Sufah, W.; Malony, A.D. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, 104 S. Wright St., Urbana, IL 61801-2987). pp 559-566 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

The Alliant FX/8 multiprocessor implements several high-speed computation ideas in software and hardware. Each of the 8 computational elements (CEs) has vector capabilities and multiprocessor support. Generally, the FX/8 delivers its highest processing rates when executing vector loops concurrently. In this paper, the authors present extensive empirical performance results for vector processing on the FX/8. The vector kernels of the LANL BMK8a1 benchmark are used in the experiments. They execute each kernel on 1 and 8 CEs and show the measured execution rate (in MFLOPS) as a function of vector length. They assess the performance of 1 CE as a vector processor by finding the vector lengths where rector processing exceeds that of scalar processing and calculating Hockney's n/sub 1/2/. For 8 CEs, they give upper/lower bounds on the achieved speedups and on the multiprocessing overhead.

17664 **Compiler generated synchronization for DO loops.** Midkiff, S.P.; Padua, D.A. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 544-551 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

This paper presents methods for the compile time generation of synchronization instructions for parallel loops running on a multiprocessor. A synchronization instruction set and architecture are defined, and using these it is shown how to synchronize FORTRAN source loops so that dependences on the parallel loop are enforced. Construction of an applicable dependence graph is covered. A program transformation is given that increases the parallelism that can be utilized in a parallel loop containing nested loops. Finally, a generalizable technique is presented for reducing the number of dependences needing synchronizing in a parallel loop.

17665 **Processor self-scheduling for multiple-nested parallel loops.** Tang, P.; Yew, P.C. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 528-535 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

Processor self-scheduling is a useful scheme in a multiprocessor system if the execution time of each iteration in a parallel loop is not known in advance and varies substantially, or if there are multiple nestings in parallel loops which makes static scheduling difficult and inefficient. By using efficient synchronization primitives, the operating system is not needed for loop scheduling. The overhead for the processor self-scheduling is small. The authors present a processor self-scheduling scheme for a single-nested parallel loop, and extend the scheme to multiple-nested parallel loops. Barrier synchronization mechanisms in the processors self-scheduling schemes are also discussed.

17666 **Execution of parallel loops on parallel processor systems.** Polychronopoulos, C.D.; Kuck, D.J.; Padua, D.A. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 519-527 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

Ways of coordinating large numbers of processors to execute a parallel program as fast as possible are of key importance to the design and efficient use of parallel processor systems. In this paper the authors discuss issues on program parallelism and scheduling for parallel processor systems. They break the scheduling process into three basic activities, and focus on processor assignment to parallel loops. Optimal processor assignment algorithms are presented for simple and complex nested parallel loops. These algorithms can be applied at compile-time, or can be implemented as hardware modules to solve the processor assignment problem optimally at run-time. Speedup measurements for EISPACK and IEEE DSP subroutines that result from the optimal assignment of processors to parallel loops are also presented. These measurements indicate that optimal assignments result in almost linear speedups on parallel processor machines with a few tens of processors, and significantly high speedups for machines with hundreds or thousands of processors.

17667 **A communication model for optimizing hierarchical multiprocessor systems.** Abraham, S.G.; Davidson, E.S. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, 305 Talbot Lab., 104 S. Wright St., Urbana, IL 61801). pp 467-474 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

Experimental hierarchical multiprocessor systems, such as the Cm*, EGPA machine and the Cedar, show that hierarchical systems encompass a range of processor configurations and interprocessor communication links. Cost and performance models are developed for the components of a hierarchical system where all processors share a global memory and processors are grouped into clusters that share a cluster memory. With these models, it is shown that a unique combination of processor speeds and numbers best achieves a given performance goal. Given the distribution of interprocessor communication, the cluster size is chosen to minimize average communication delay. When the patterns of communication correspond directly to some parallel architecture, the analysis indicates the effectiveness of the hierarchical system in emulating that architecture. The primary objective is to compare various processor configurations in large systems. Thus, the models developed ignore factors that tend to have a similar effect on a wide range of configurations.

17668 **Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions.** Berry, M.; Sameh, A. (Center for Supercomputing Research and Development, Univ. of Illinois, Urbana, IL 61801). pp 433-440 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

The authors present two parallel algorithms based on Jacobi's method for real symmetric matrices to determine the complete eigensystem of a dense real symmetric matrix and the singular value decomposition of rectangular matrices on a multiprocessor. The intent is to study the advantages of using Jacobi and Jacobi-like schemes over new and existing EISPACK and LINPACK routines on an Alliant FX/8 computer system. For the dense symmetric eigenvalue problem, the authors show promising results for small-order matrices. A "one-sided" Jacobi-like algorithm which produces the singular value decomposition of a rectangular matrix is shown to provide superior performance for rectangular matrices in which the number of rows is much larger than the number of columns.

17669 **Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system.** Jalby, W.; Meier, U. (Center for Supercomputing Research and Development, Univ. of Illinois, Urbana, IL 61801). pp 429-432 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

Memory organizations of supercomputers (CRAY 2, CEDAR) tend to become more and more complex, and correspondingly data management in these memories becomes a crucial factor for achieving high perform. nce. The authors study here an architecture combining vector and parallel capabilities on a two-level shared memory structure. For this class of architecture, they analyze and optimize matrix multiplication algorithms so as to obtain high efficiency kernels which can be used for many numerical algorithms such as LU and Cholesky factorizations, as well as Gram-Schmidt and Householder orthogonal factorization schemes. The performance of such kernels on the Alliant FX/8 multiprocessor is described in detail.

17670 **Parallel structuring of control and resources management systems for parallel programs.** O'Dell, R.; Browne, J.C. (Dept. of Computer Sciences, The Univ. of Texas at Austin, Austin, TX 78712). pp 153-156 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

This paper presents a study of the effect of parallel structuring of control and resource management algorithms upon the execution of parallel computations. A simple analytic model of general parallel computation incorporating overhead effects was developed and applied to this example. Speed-up shows a square root dependency on the degree of parallelism in the control and resource management algorithms. Variance in processing time for the tasks being controlled was observed to be beneficial over certain ranges of execution to the parallelism obtainable by the control system.

17671 **SK-banyans: A unified class of banyan networks.** deMelo, J.; Jenevein, R.M. (Dept. of Electrical and Computer Engineering, Univ. of Texas at Austin, Austin, TX 78712). pp 100-107 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

A unified class of banyan networks is proposed which presents better distance properties than SW-banyans. This new class is called SK-banyans for the SKewing scheme that is adopted for the connections between nodes at different levels. Its definition is given along with the characteristic properties relative to SW-banyans. A consideration is given for the virtue of symetric connection schemes in relation to their distance properties. Examples of different Characteristic Connection Patterns (CCP's) for SK-banyans are presented. A general construction scheme is proposed and a comparison of distance properties of SK- and SW-banyans is presented. Optimality criteria have been developed to determine whether a given CCP provides the best distance properties.

17672 **A pipelined solution method of tridiagonal linear equation systems.** Gao, G.R. (Lab. for Computer Science, Massachusetts Institute of Technology, Cambridge, MA 02139). pp 84-91 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

A pipelined solution method for tridiagonal systems of linear equations is proposed which introduces parallelism in a way that may be effectively exploited by static data flow computers. It eliminates the substantial data rearrangement overhead incurred by many existing parallel algorithms, and sustains a relatively constant parallelism during various phases of program execution. Using the new method, the authors outline a pipelined code mapping scheme. The principle outlined in this paper may be extended to other suitable parallel machine architecture.

17673 **Distributing hot-spot addressing in large-scale multiprocessors.** Yew, P.C.; Tzeng, N.F.; Lawrie, D.H. (Center for Supercomputing Research and Development, Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). pp 51-58 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

When a large number of processors try to access a common variable, referred to as hot-spot accesses, not only can the resulting memory contention seriously degrade performance, but it may also cause tree saturation in the interconnection network which blocks both hot-spot and regular requests alike. It is shown elsewhere that even if only a small percentage of all requests are to a hot-spot lo-

cation, these requests can cause very serious performance problems, and networks that do the necessary combining of requests are suggested to keep the interconnection network and memory contention from becoming a bottleneck. Instead the authors propose a software combining tree concept and show that it is effective in decreasing memory contention and preventing tree saturation because it distributes hot-spot accesses over a software tree whose nodes can be dispersed among many memory modules. Thus it is an inexpensive alternative to expensive combining networks.

17674 **The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots'.** Lee, G.; Kruskal, C.P.; Kuck, D.J. (Center for Supercomputing Research and Development, Univ. of Urbana, IL 61801). pp 35-41 of Proceedings of the 1986 international conference on parallel processing. Hwang, K.; Jacobs, S.M.; Swartzlander, E.E. Piscataway, NJ; IEEE Service Center (1986). (CONF-860877—).

From International conference on parallel processing; St. Charles, IL, USA (19 Aug 1986).

Concurrent requests to a shared variable by many processors on a shared memory machine can create contention that will be serious enough to stall large machines. This idea has been formalized in the "hot spot" traffic model, where a fixed fraction of memory requests is for single shared variable. "Combining," in which several requests for the same variable can be combined into a single request, has been suggested as an effective method of alleviating this contention. The NYU Ultracomputer and the IBM RP3 machine use "pairwise" combining, in which only two requests for the same variable can be combined at a switch. The authors study the effectiveness of combining. In particular, it turns out that pairwise combining cannot handle hot spots if the machine size is large enough. They suggest ways to overcome this weakness.

17675 **Japanese supercomputer initiatives: Challenge and response.** Worlton, W.J. (Los Alamos National Lab., Los Alamos, NM). pp 46-65 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

Some of the key factors in the supercomputing market are summarized. Speed is perhaps the most important single factor, but this is left as a question because there are no available benchmark data on the speed of the Japanese computers. The length of the design cycle may favor Japanese firms because they are vertically integrated. This implies that the American firms must counter this Japanese advantage, and both Cray Research (CRI) and Engineering Technology Associates (ETA) Systems are taking steps to do this. CRI is developing an in-house gallium arsenide development capability, and ETA is planning to use CMOS technology, which, although not an in-house capability for ETA, is expected to be available on the time scale needed. The reliability factor has been noted as a Japanese advantage just on general grounds of the well-known reliability of Japanese electronics.

17676 **The New York University Ultracomputer.** Gottlieb, A. (New York Univ., New York, NY). pp 66-77 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

Continuing advances in very large scale integration (VLSI) technology promise to provide fast floating-point processors and megabit memory chips within the present decade. The New York University (NYU) "Ultracomputer Group" has been studying how such ensembles can be constructed and has produced a design that includes novel hardware and software components. A pervasive consideration for this design is that it be free of serial sections (that is, hardware or software modules to which each processor requires exclusive access), because even small serial sections become a bottleneck bounding the maximum possible speedup. This paper outlines the proposed hardware design and describes its relation to other research in parallel processing.

17677 **Computation: The nexus of nuclear weapon development.** Henderson, D.B. (Los Alamos National Lab., Los Alamos, NM). pp 141-151 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

The development of nuclear weapons is qualitatively unlike any other engineering enterprise in that a broad collection of phenomena from generally distinct fields of science is exploited in a tight interdisciplinary fashion. Many of the parameters are at the limits of both the current practice and (accurate) knowledge base. Moreover, and most importantly, the exploited phenomena are deliberately nonlinear. In contrast, almost all other engineering practices are linear or are at least linearized. The nonlinear processes are often nonlocal and are often in non-equilibrium. How things work depends on unobserved and, in general, unobservable phenomena. Numerical simulation through computer codes is, therefore, central to the design process. Simulation is the only place in which all of the nonlinear complex phenomena are integrated.

17678 **An overview of computing at Los Alamos.** Ewald, R.H. (Los Alamos National Lab., Los Alamos, NM). pp 152-156 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

The Los Alamos National Laboratory is operated by the University of California for the United States Department of Energy (DOE). The Laboratory employs about 7000 people, and its mission is to perform research and development activities related to national security and energy programs. To support its own and other national programs, the Laboratory has developed a state-of-the-art scientific computing network that supports about 4500 users (about 3500 are Laboratory employees and about 1000 are users at other installations throughout the United States).

17679 **Operating systems and basic software for high-performance parallel architecture.** Browne, J.C. (Univ. of Texas, Austin, TX). pp 157-178 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

It is well established that future generations of supercomputers will be based on parallel architectures. It is critical to recognize that parallel computing is a systems problem, not just an architecture problem or a component problem. Development of basic software, including operating systems and programming languages for parallel architecture, is intrinsically more difficult than development of basic software systems for sequentially structured architectures. This added degree of difficulty results from the greater dimensionality and complexity of models of parallel computation over models of sequential computation. This paper explores the sources of complexity and the development of efficient basic software systems for parallel architectures. One approach to the two problems of management of many resources and the complexity of parallel architectures is defined and discussed in detail. This is the approach built upon reconfigurable architectures and partitioning rather than sharing of resources. The structure of the TRACOS operating system for the Texas Reconfigurable Array Computer (TRAC) is used as an example.

17680 **The role of better algorithms.** Glimm, J. (New York Univ., New York, NY). pp 217-230 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

Computers will affect science and technology at least as profoundly as did the invention of calculus. The reasons are the same. As with calculus, computers have increased and will increase enormously the range of soluble problems. The full development of these events will occupy decades, and the rapid progress that one sees currently is a strong sign that the impact of computers will be much greater in the future than it is today. This rapid progress has been found in two areas: in the computers themselves and in the methods for using them, that is, in the hardware and in the software. In this paper the authors focus on the second of these issues, which is the requirement of computational science for better algorithms. The needs for better algorithms have been recognized by others, and thoughtful people have projected comparable roles for hardware and software in overall computational progress.

17681 **Super problems for supercomputers.** Harlow, F.H. (Los Alamos National Lab., Los Alamos, NM). pp 231-238 of Frontiers of supercomputing. Metropolis, N.; Sharp, D.H.; Worlton, W.J.; Ames, K.R. Berkeley, CA; Univ. of California Press (1986).

The authors discuss topics such as generalized Boltzmann's equations and flow in complex spaces. The authors have used some of these techniques for the study of problems in continuum mechanics and have become familiar with procedures that are available for their solution. One can apply some of these same ideas to the most remarkable kinds of problems, with results that have a strong potential for being realistic. Indeed, one might go so far as to say that such investigations can be crucial to the understanding of where humanity is heading in future generations.

9903 Information Handling

REFER ALSO TO CITATION(S) 17196

9904 Law

17682 **(INIS-XN—23) Atomic Energy Authority Act 1986.** (International Atomic Energy Agency, Vienna (Austria)). 19 Feb 1986. 7p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701297.

Under this Act the UKAEA is given power to borrow so that it can finance its capital expenditure programme, and will undertake a debt to the Secretary of State for Energy representing its assets. Power is given for the Government to guarantee such borrowing. The UKAEA has been organised financially on the basis of a trading fund. The Act came into force on 1 April 1986. (NEA).

17683 **(INIS-XN—24) Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985.** (International Atomic Energy Agency, Vienna (Austria)). 3 Jun 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE87701298.

The Agreement came into force on the date of its signature. In English with Exchange of Letters also in Chinese.

The Agreement covers in particular co-operation in civil nuclear research, including reactor safety, radioactive waste management and radiation protection. Co-operation between the two Parties shall be for exclusively peaceful purposes and the transfer to third parties of any nuclear material, equipment or facilities supplied in the context of the present Agreement may not take place without prior consultation between the two Governments. In the event of such a transfer, the two Governments shall ensure that the third state pledges peaceful use only and accepts IAEA safeguards. (NEA).

17684 **(INIS-XN—40) Decree relating to the competence of the National Board of Health to issue permits under the Radiation Protection Act, 5.2.1959/47.** (International Atomic Energy Agency, Vienna (Austria)). 5 Feb 1959. 1p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701302.

This decree made under the Radiation Protection Act of 1957 concerns the National Board of Health and provides in particular that the Board is the competent authority to issue permits in the field of radiation protection. (NEA).

17685 **(INIS-XN—43) Decree setting up the Atomic Energy Commission, as amended (No. 76/58).** (International Atomic Energy Agency, Vienna (Austria)). 14 Feb 1958. 6p. (In Finnish). NTIS (US Sales Only), PC A02/MF A01. File Number DE87701305.

English translation attached.

This Decree issued in implementation of Section 7 of the Atomic Energy Act of 25th October 1957 sets up the Atomic Energy Commission. The Commission, composed of not more than 5 members appointed by the Council of State for a period of 3 years, is subordinate to the Ministry of Trade and Industry. In the field of Atomic Energy, its task is to make proposals, to give expert opinions, to deal with questions relating to international co-operation, to ensure liaison with scientific and technical organisations and industrial institutions whose activities coincide with its own sphere of activity. The Commission must submit a report on its activities to the Ministry of Trade and Industry each year. (NEA).

CORPORATE AUTHOR INDEX

In the Corporate Author Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the document title and the volume and abstract numbers. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German, are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes.

DOE Energy Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

A

Advanced Fuel Research, Inc., East Hartford, CT (USA)
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985, 12:15279 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)

Aerospace Corp., El Segundo, CA (USA)
Contributions to the 18th International Cosmic Ray Conference, 12:16935 (R;US)

Aerospace Corp., El Segundo, CA (USA). Chemistry and Physics Lab.
Effects of hydrolysis on metallo-organic solution deposition of PZT [lead zirconate titanate] films, 12:16347 (R;US)

Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA). School of Systems and Logistics
Hazardous-waste management: a descriptive study. Master's thesis, 12:16156 (R;US)

Alabama Univ., Huntsville (USA)
Space plasma research. Final report, August 1980-August 1986, 12:17413 (R;US)

Alabama Univ., University (USA). School of Mines and Energy Development
1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)

American Inst. of Architects, Washington, DC
Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)

Ames Lab., IA (USA)
Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)

AN SSSR, Moscow. Fizicheskij Inst.
Experimental and theoretical physics. Collection, 12:17189 (R;SU;In Russian)

AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
Simulation of ion cyclotron resonance heating through resonant absorption in two-ion species plasma, 12:17401 (R;US)

AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki
Chiral anomalies and finite-mode regularization of the fermion integral, 12:17168 (R;SU;In Russian)
Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)
Echo in a magnetized low-turbulent plasma, 12:17408 (R;SU;In Russian)
Generating matrix elements of the Hamiltonian of the algebraic version of resonating group method on intrinsic wave functions with various oscillator lengths, 12:17372 (R;SU)
On the mass loss rate by the nuclei of planetary nebulae, 12:16957 (R;SU;In Russian)
Phenomenologic consideration of quark degrees of freedom in potential description approach, 12:17288 (R;SU)
Quantum field theory renormalization in curved space-time and renormalization group equations, 12:17167 (R;SU;In Russian)
Reduction of integral equations for four identical particles in the case of finite range forces, 12:17370 (R;SU;In Russian)
Short-wave convective turbulence and anomalous electron thermal conductivity of a plasma, 12:17409 (R;SU)
Study of the P-matrix structure using a potential description of two-particle interaction, 12:17371 (R;SU)
UBVRI-photometry of the antiflare stars V586 Ori and IU Ori, 12:16958 (R;SU;In Russian)

AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij
Automation correlation installation on-line with a computer, 12:16642 (R;SU;In Russian)
Calculation technique and results of nonstationary fields of energy release in RBMK reactors, 12:15962 (R;SU;In Russian)
Deuteron break up in Coulomb field of nuclei, 12:17297 (R;SU;In Russian)
Device for digital data transmission by a coaxial cable, 12:16490 (R;SU;In Russian)
Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face, 12:16645 (R;SU;In Russian)
Influence of the crater at the target surface on the ion outflow from laser produced plasma, 12:16562 (R;SU;In Russian)
Investigation of backgrounds of scintillation and semiconductor detectors in the underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences, 12:16644 (R;SU;In Russian)
POMNK-programme of experimental data approximation by linear combination of functions, 12:17653 (R;SU;In Russian)
Problems and perspectives of the U-240 control system development, 12:16510 (R;SU;In Russian)
Radioactive contaminations of materials for low-background setups, 12:16643 (R;SU;In Russian)
Representation on flow information systems with Petri nets use, 12:17652 (R;SU;In Russian)
Results of underground experiment of neutrinoless double beta-decay of /sup 76/Ge, 12:17226 (R;SU;In Russian)
Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters, 12:17252 (R;SU;In Russian)
Software of the module of automatic control system by power supply of the U-240 cyclotron, 12:16511 (R;SU;In Russian)
Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)

Arawak Consulting Corp., New York (USA)
ICP [Institutional Conservation Program] monitoring: Final report, 12:16201 (R;US)

Arbeitsgruppe Wiederaufarbeitung an der Univ. Bremen (Germany, F.R.)
Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian

Ministry of State for Regional Development and Environmental Affairs, 12:15388 (R;DE;In German)
Arbeitskreis fuer die Nutzbarmachung von Siedlungsabfaellen e.V. (ANS), Wiesbaden (Germany, F.R.)
Studies on heavy metals in household refuse and on heavy metals concentration in certain fractions or groups of materials by suitable treatment, 12:16774 (R;DE;In German)
Argonne National Lab., Idaho Falls, ID (USA)
An integrated plant-life extension program for EBR-II [Experimental Breeder Reactor], 12:15975 (R;US)
Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models, 12:17192 (R;US)
EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software, 12:15976 (R;US)
Experience with EBR-II [Experimental Breeder Reactor] driver fuel, 12:15979 (R;US)
Factors controlling metal fuel lifetime, 12:15850 (R;US)
Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel, 12:16016 (R;US)
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)
Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements, 12:15848 (R;US)
Argonne National Lab., IL (USA)
Advanced research in instrumentation and control technology: Multiphase flow studies, 12:15323 (R;US)
Advanced research in instrumentation and control technology: Acoustic parameter studies, 12:16599 (R;US)
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
Age dependent retention of ^{212}Pb in the skeleton following ^{224}Ra uptake, 12:16857 (R;US)
Aging degradation of cast stainless steel, 12:15765 (R;US)
An approach to the verification of a fault-tolerant, computer-based reactor safety system: A case study using automated reasoning: Volume 2, Appendixes: Interim report, 12:16028 (R;US)
An overview of low-energy ion-atom collisions, 12:17067 (R;US)
ATLAS accelerator laboratory report, 12:16508 (R;US)
Atomic-defect mechanisms for diffusion in refractory bcc metals, 12:16248 (R;US)
Automated reasoning and knowledge base design in the scientific programming environment, 12:17643 (R;US)
Batteries for hybrid vehicles or other high-power applications, 12:16234 (R;US)
Battery thermal modeling: The methodology and applications, 12:16148 (R;US)
Biological engineering for sustainable biomass production, 12:15600 (R;US)
Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)
Breached pin performance in the EBR-II RBCB program, 12:15977 (R;US)
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Calculation of the properties of vacancy clusters in copper using a new, efficient energy minimization scheme, 12:16251 (R;US)
CCD[charge-coupled device]-based synchrotron x-ray detector for protein crystallography: Performance projected from an experiment, 12:16600 (R;US)
Characterization of monolithic fuel cell components, 12:16191 (R;US)
Comparisons of PRD [power-reactivity-decrements] components for various EBR-II configurations, 12:15974 (R;US)
Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air, 12:15326 (R;US)
Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
Covariances for measured activation and fission ratios data, 12:17256 (R;US)
Deriving properties of systems from properties of parts and lists of connections, 12:17640 (R;US)
Design and economics of large fuel cell power plants, 12:16188 (R;US)
Detection of near-surface ^{52}Cr segregation in irradiated $^{51}V(Cr)$ by RBS [Rutherford Backscattering Spectrometry], 12:16257 (R;US)
Development of a polarized deuterium target by spin exchange with optically pumped K, 12:16540 (R;US)
Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials, 12:16327 (R;US)
Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
Downstream behavior of fission products, 12:15965 (R;US)
Economic challenges facing rural electric cooperatives, 12:16171 (R;US)
Effect of changes in DOE pricing policies for enrichment and reprocessing on research reactor fuel cycle costs, 12:15869 (R;US)
Effects of gamma radiolysis on waste package components, 12:16263 (R;US)
Elastic properties of superlattices, 12:16260 (R;US)
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Estimated monthly emissions of sulfur dioxide and oxides of nitrogen for the 48 contiguous states, 1975-1984: Volume 2, Supporting data bases and monthly SO_2 and NO/sub x/ estimates by state, 12:16770 (R;US)
Experience with EBR-II [Experimental Breeder Reactor] driver fuel, 12:15979 (R;US)
Extending the reach of the SSC [Superconducting Super Collider], 12:16503 (R;US)
Factors controlling metal fuel lifetime, 12:15850 (R;US)
Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Formation of submicron metastable phase structures in alloys with focused electron or proton beams, 12:16261 (R;US)
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
HDR [Heissdampfreaktor] Phase 2 vibrational experiments, 12:16020 (R;US)
High-temperature fuel cells, 12:16192 (R;US)
Illinois biotechnology resources: An overview, 12:15601 (R;US)
Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)
Long-term loss of radium in 63 subjects first exposed at ages 6 to 46, 12:16855 (R;US)
Magnetic phase transitions in nanocrystalline erbium, 12:16255 (R;US)
Magnetic properties of novel epitaxial films, 12:16254 (R;US)
Measurements of pressure drop in turbulent pipe flows of highly loaded HDPE slurries, 12:16200 (R;US)
Mild oxidative solubilization of coal macerals, 12:15300 (R;US)
Nature of coupling and dimensional crossover in superconducting multilayers, 12:17354 (R;US)
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
Note on electron spectrometer requirements for deep inelastic scattering studies, 12:16601 (R;US)
Nuclear physics with internal targets in electron storage rings, 12:17203 (R;US)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)
Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel, 12:16016 (R;US)
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)
Phases in U-Si alloys, 12:16256 (R;US)
Posttest examination results of recent treat tests on metal fuel, 12:15978 (R;US)
Precipitation of Kr in Ni at room temperature, 12:16262 (R;US)
Preliminary LEU fuel cycle analyses for the Belgian BR2 reactor, 12:15981 (R;US)
Production of freely-migrating defects during irradiation, 12:16250 (R;US)
Progress on molten carbonate fuel cell alternative cathodes, 12:16189 (R;US)
Progress on the IPNS Enriched Uranium Booster Target, 12:16542 (R;US)
Properties of gluon jets, 12:17095 (R;US)
Protective coatings and claddings: Application/evaluation, 12:15272 (R;US)
Radioactive waste isolation in salt: Peer review of the Office of Nuclear Waste Isolation's draft report on a multifactor test design to investigate uniform corrosion of low-carbon steel, 12:16237 (R;US)
Radium uptake in utero, 12:16856 (R;US)
Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements, 12:15848 (R;US)

Report of the working group on detector simulation, 12:16594 (R;US)
Safety aspects of LMR [liquid metal-cooled reactor] core design, 12:16015 (R;US)
Scientific opportunities at the proposed 6-7 GeV Advanced Photon Source, 12:16539 (R;US)
Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Temperature effects on nickel/iron battery characteristics, 12:16149 (R;US)
Tests of QCD in high energy spin reactions, 12:17123 (R;US)
The ANL experiment for a wake field accelerator using an rf structure, 12:16502 (R;US)
The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor, 12:15383 (R;US)
The ATLAS Positive-Ion Injector project, 12:16541 (R;US)
The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
The integral fast reactor fuels reprocessing laboratory at Argonne National Laboratory, Illinois, 12:15384 (R;US)
The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
Theory of the energetics and nonclassical nucleation for the tetragonal-monoclinic transformation of zirconia, 12:16328 (R;US)
Thermal impact of Na3(U/sub 1-y/Pu/sub y/)O4 formation on a breached LMR fuel element, 12:15980 (R;US)
Thermal-hydraulic aspects of flow inversion in a research reactor, 12:15982 (R;US)
Thin film coatings which inhibit spin relaxation of polarized potassium atoms, 12:16538 (R;US)
Time constants and feedback transfer functions of EBR-II [Experimental Breeder Reactor] subassembly types, 12:15973 (R;US)
TMI-2 lower vessel debris examinations, 12:16024 (R;US)
Toward formal analysis of ultra-reliable computers: A total systems approach, 12:17644 (R;US)
Transient bowing of core assemblies in advanced liquid metal fast reactors, 12:15846 (R;US)
Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots, 12:16795 (R;US)
Vacancy migration enthalpy in tungsten at high temperatures, 12:16252 (R;US)
Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)
Variational Monte Carlo calculations of few-body nuclei, 12:17206 (R;US)
What underlies the Anderson Hamiltonian, 12:17357 (R;US)

Arizona Public Service Co., Phoenix (USA)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)

Arizona State Univ., Tempe (USA). Dept. of Electrical Engineering
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)

Arizona Univ., Tucson (USA)
Site characterization field manual for near surface geologic disposal of low-level radioactive waste, 12:15422 (R;US)

Atmospheric and Environmental Research, Inc., Cambridge, MA (USA)
Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986, 12:17031 (R;US)

Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)

Auburn Univ., AL (USA). Dept. of Chemical Engineering
Laser light-scattering and laser fluorescence studies of solvent extraction systems, 12:16384 (R;US)

Australian Atomic Energy Commission Research Establishment, Lucas Heights. Local Liaison Working Party
APTCARE - Lucas Heights. A plan to cope with accidents at the Research Establishment of the Australian Atomic Energy Commission, Lucas Heights, NSW, 12:16037 (R;AU)

B

Bartol Research Foundation of the Franklin Inst., Newark, DE (USA)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)

Battelle Columbus Div., OH (USA)
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)

Battelle Columbus Labs., OH (USA)
Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)
Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)
Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)

Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Laboratory investigation of crushed salt consolidation and fracture healing, 12:16925 (R;US)
Preliminary rock mechanics laboratory: Investigation plan, 12:16924 (R;US)
Rail transportation corridor analysis report: Deaf Smith County location in the Palo Duro Basin, Texas, 12:15487 (R;US)

BDM Corp., Albuquerque, NM (USA)
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)

Bell Labs., Murray Hill, NJ (USA)
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)

Bettis Atomic Power Lab., West Mifflin, PA (USA)
An automated two-dimensional laser velocimeter system, 12:16674 (R;US)
In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)
On-line ion chromatography system, 12:16395 (R;US)

Bhabha Atomic Research Centre, Bombay (India)
Annual report of the Nuclear Physics Division [for] period ending December 31, 1982, 12:17190 (R;IN)

Biennial report for 1982 and 1983 of Electronics Division, 12:16593 (R;IN)
BOXER3: a three dimensional integral transport code for PHWR supercell, 12:15837 (R;IN)
Calculation of damage cross section, 12:17305 (R;IN)
Calibration of high-dose radiation facilities (Handbook), 12:17329 (R;IN)
Computerised automatic pellet inspection unit for FBTR fuel, 12:15955 (R;IN)
Cryogenic regenerators, 12:16438 (R;IN)
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)
Development of optical thin film technology for lasers and synchrotron radiation, 12:16348 (R;IN)
Electrode boundary layer and its influence on the power output characteristics in open-cycle Faraday MHD generators, 12:16184 (R;IN)
Heavy ion collisions, the quark-gluon plasma and antinucleon annihilation, 12:17125 (R;IN)
Liquid Metal MHD Generator Systems, 12:16185 (R;IN)
Low incremental control worth reload patterns for BWRs, 12:15761 (R;IN)
Pool type liquid helium cryopump, 12:16439 (R;IN)
Progress report on nuclear data activities in India for the period from July 1984 to December 1985, 12:17191 (R;IN)
Radiation enhanced self diffusion in silver, 12:17336 (R;IN)
RF-phase measurement and optimization for the Variable Energy Cyclotron, Calcutta, 12:16520 (R;IN)
Semi-microdetermination of nitrogen in actinide compounds by Dumas method, 12:16376 (R;IN)
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
SHARDA - a program for sample heat, activity, reactivity and dose analysis, 12:17304 (R;IN)
Spectrographic determination of boron in Mo-B microalloys, 12:16380 (R;IN)
Status of data and data needs for XRF and PIXE based element analysis, 12:16377 (R;IN)
Tarapur dual cycle BWR - analysis of steam generator bypass incident, 12:15762 (R;IN)
Thermodynamic data of intermetallic compounds, 12:16238 (R;IN)
Two dimensional analysis for magnetic flux distribution in electromagnet used for MHD applications, 12:17086 (R;IN)
Water Chemistry Division Progress Report, April 1983-April 1985, 12:16399 (R;IN)
X-ray fluorescence analysis of thulium oxide/oxalate for rare earth impurities, 12:16378 (R;IN)
X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria, 12:16374 (R;IN)

Bochum Univ. (Germany, F.R.). Lehrstuhl fuer Energieanlagentechnik
Experimental investigation of the formation of nitrogen oxides in combustion of coal dust. 2nd intermediate report covering the period from May 1, 1983 to June 30, 1984, 12:15329 (R;DE;In German)

Boeing Computer Services Co., Seattle, WA (USA)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)

Boeing Computer Services Co., Tukwila, WA (USA)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)

Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)
Two-particle correlations in $^{40}Ar + {}^{197}Au$ at 60 MeV/A, 12:17234 (R;FR)

Brandeis Univ., Waltham, MA (USA)
Effect of light and development of photosynthetic cells: Final report, 12:15602 (R;US)

Brigham Young Univ., Provo, UT (USA)
Pioneer 10 and 11 (Jupiter and Saturn) magnetic field experiments. Final report, 12:17032 (R;US)

Brigham Young Univ., Provo, UT (USA). Combustion Lab.
Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)

Brigham Young Univ., Provo, UT (USA). Dept. of Chemical Engineering
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)

British Gas Corp., London
Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body, 12:16883 (TG;GB)

British Geological Survey, Keyworth. Geothermal Resources Programme
Further investigations of the UK heat flow field (1981-1984). Investigation of the geothermal potential of the UK, 12:15628 (R;GB)
Heat flow and regional groundwater flow in the United Kingdom. Investigation of the geothermal potential of the UK, 12:15626 (R;GB)

Brookhaven National Lab., Upton, NY (USA)
Annealing of cold worked hypostoichiometric Ni_3Al alloys using positron lifetime spectroscopy, 12:16240 (R;US)
Applications of synchrotron x-ray fluorescence to extraterrestrial materials, 12:16535 (R;US)
Atomic physics and synchrotron radiation: The production and accumulation of highly charged ions, 12:17058 (R;US)
Brookhaven National Laboratory: Technology transfer report, Fiscal year 1983, 12:16158 (R;US)
Carboxyl group reactivity in actin, 12:16794 (R;US)
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
Design considerations for a combined synchrotron-light source and heavy-ion storage ring Atomic Physics Facility, 12:16533 (R;US)
Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Experimental results on spin physics at the AGS, 12:17096 (R;US)
Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
Modes of storage ring coherent instabilities, 12:16571 (R;US)
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Quasar uncertainty study, 12:16004 (R;US)
Release of organic chelating agents from solidified decontamination wastes, 12:15408 (R;US)
Spin-waves in the uniaxial spin-glass system Fe/sub 1-x/Mg/sub x/Cl_2, 12:17337 (R;US)
SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
Studies of aluminum in rat brain, 12:16884 (R;US)
Synthesizing seismic fragility of components by use of existing data, 12:16006 (R;US)
The fifth force, 12:17126 (R;US)

Thylakoid phosphoproteins, 12:15598 (R;US)
Trace element measurements using white synchrotron radiation, 12:16534 (R;US)
Uncertainties in scientific measurements, 12:17216 (R;US)
Brown Univ., Providence, RI (USA)
Global paleoclimatic data for 6000 yr B.P., 12:16692 (R;US)
Brown Univ., Providence, RI (USA). Div. of Engineering
Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
Building Research Establishment, Watford (UK)
Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)
Bundesamt fuer Energiewirtschaft, Wuerenlingen (Switzerland). Abt. fuer die Sicherheit der Kernanlagen
Chernobyl accident: An overview of causes and effects, 12:16031 (R;CH;In German)
Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)
Biomass partial gasification. Final report, 12:15584 (R;DE;In German)
Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report, 12:15618 (R;DE;In German)
Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)
Annual report of the electric power industry of the Federal Republic of Germany 1985. (Summary of the quarterly reports). Power generation in publicly-owned electric utilities, the industrial independent units and the Federal Railways and overall the electric power consumption in the Federal Republic of Germany, 12:16175 (R;DE;In German)
Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria)
Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)
Bureau of Mines, Twin Cities, MN (USA). Twin Cities Research Center
Surface and underground coal-mine-equipment population, 1982. Information Circular/1986, 12:15322 (R;US)

C

California Inst. of Tech., Pasadena (USA)
Caltech Concurrent Computation Program: Annual report, 1985-86, 12:17645 (R;US)
CALTECH: DOE program on numerical analysis, computing and fundamental studies in fluid mechanics: Summary report No. 12, April 1, 1986-March 31, 1987, 12:17087 (R;US)
Heavy flavors, 12:17155 (R;US)
Hypercube tracking: A preliminary status report, 12:16682 (R;US)
Optimization by a computational neural net, 12:17343 (R;US)
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
California Inst. of Tech., Pasadena (USA). Dept. of Physics
CUBIX: Programming hypercubes without programming hosts, 12:17646 (R;US)
California State Air Resources Board, Sacramento (USA)
Interlaboratory study of benzene stability of tedlar bags. Final report, 12:16714 (R;US)
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
California Univ., Berkeley (USA)
Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
California Univ., Irvine (USA)
Solar flare x-ray polarimetry. Final scientific report, 1 April 1984-30 September 1986, 12:17034 (R;US)
California Univ., Los Angeles (USA). Dept. of Atmospheric Sciences
Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
California Univ., San Diego, La Jolla (USA)
Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
Cambridge Systematics, Inc., Berkeley, CA (USA)
REEPS [Residual End-Use Energy Planning] code: User's guide, 12:16181 (R;US)
Carnegie Institution of Washington, DC (USA)
Chromospheric activity of cool giant stars. Final report, 12:17030 (R;US)
Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics
Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)
CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)
Ductility of materials under dynamic solicitations, 12:16243 (R;FR;In French and English)
Static and dynamic aspects of nuclear matter distribution: microscopic calculations and experimental data, 12:17253 (R;FR;In French)
Test unit for measurement of small masses of alpha wastes, 12:15409 (R;FR;In French)
Tritium detection in installations and in environment, 12:17425 (R;FR;In French)
CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)
Absorption of aluminium X-ray lines in a laser created gold plasma, 12:17398 (R;FR)
Approximation of Fokker-Planck equation by a deterministic particle method, 12:17399 (R;FR;In French)
Electron acceleration by a localized electric field, 12:17396 (R;FR)
Ionization model for nickel-like gold, 12:16464 (R;FR)
Model for the acceleration of laser irradiated targets, 12:17431 (R;FR)
Numerical solution of transport equations with particle correction, 12:17356 (R;FR;In French)
PHEBUS: a new powerful laser facility for ICF research, 12:17430 (R;FR)
Population model for nickel-like gold which transitions to discard, 12:17060 (R;FR)
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Review of X-ray laser research at CEL-V, 12:16463 (R;FR)
Spectral line shapes of X-ray dipoler emission in high densities plasmas, 12:17062 (R;FR)
Utilisation of image intensifiers used in conjunction with streak cameras, 12:16670 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Low and medium level liquid waste processing at the new La Hague reprocessing plant, 12:15411 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. d'Analyse de Surete
Validation study of the intertran model for assessing risks of transportation accidents: Road transport of uranium hexafluoride, 12:15489 (R;FR)
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire
Calculation RTGV, 12:16007 (R;FR;In French)
PKL, 12:16008 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
CEA R and D contribution to the La Hague extension plant, 12:15379 (R;FR)
Hydrogen doping of silica by ion beam enhanced hydration, 12:16349 (R;FR)
Irradiation damage in boron carbide: point defects, clusters and helium bubbles, 12:16325 (R;FR)
Irradiation damage in γ-LiA$1O_2$, 12:16326 (R;FR)
Relationship between leaching of trace elements (Cs, Sr and Co) and microstructure during aging of a mortar with a matrix of artificial Portland cement, 12:16350 (R;FR;In French)
Synthesis and structure of $[(UO_2)_6(N_2)_{16}O_2]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$, 12:16428 (R;FR)
Tritium management in PWR fuel reprocessing plants, 12:15410 (R;FR;In French)

CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Div. de Metallurgie et d'Etude des Combustibles Nucleaires
Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme, 12:16034 (R;FR)
CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme, 12:16034 (R;FR)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)
Bibliographic study of photophysical and photochemical properties of laser dyes, 12:16465 (R;FR;In French)
Conformal invariance and finite size effects in critical two dimensional statistical models, 12:17158 (R;FR)
Differential cross-sections of fine structure transitions in K (4P) - He, Ar collisions, 12:17063 (R;FR)
Evolution of the fusion like process around the Fermi energy, 12:17227 (R;FR)
Feedback system analysis for beam breakup in a multipass multisection electron linac, 12:16507 (R;FR)
Formation and decay of hot nuclei, 12:17240 (R;FR)
Formation and decay of hot nuclei, 12:17241 (R;FR)
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
Giant resonance excitation by inelastic scattering of medium energy ^{13}C ions, 12:17233 (R;FR)
Heavy element compositions and energy spectra of galactic and solar cosmic rays, 12:16940 (R;FR;In French)
Influence of an external electric field on thermal collisions between circular Rydberg-state atoms and ground-state helium, 12:17061 (R;FR)
Measurement of the muon capture rate in liquid deuterium by the lifetime technique, 12:17204 (R;FR)
New exact inhomogeneous solutions of the Boltzmann equations, 12:17059 (R;FR)
On short-range rapidity fluctuations in high energy collisions, 12:17127 (R;FR)
Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)
Quantum-mechanical study of fine-structure transitions in collisions of Rb(5^{2}Psub(j)) with H_2 and D_2, 12:17064 (R;FR)
Studying reactor antineutron oscillations with large underground detectors, 12:16596 (R;FR)
Survey of research in elementary particle physics, 12:17128 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Composite beryllium-ceramics breeder pin elements for a gas cooled solid blanket, 12:17426 (R;FR)
Development of large components for the fusion reactor vacuum circuits, 12:17427 (R;FR)
European effort on materials, 12:16244 (R;FR)
Interaction of GeV heavy ions with solids-first results at GANIL, 12:16536 (R;FR)
Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Multiphoton dissociation of UF6 at lambda = 16 μm in supersonic jets, 12:16400 (R;FR)
Principal modes of rupture encountered in expertise of advanced components, 12:16245 (R;FR;In French)
Study of a breeding material - γ lithium aluminate, 12:17428 (R;FR)
Surface quenching of zirconium alloys by laser, 12:16246 (R;FR;In French)
Synthesis and structure of $[(UO_2)_8(N_3)_{16}O_8]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$, 12:16428 (R;FR)
Thermodynamic properties of hydrated electron, 12:16427 (R;FR;In French)
CEA Etablissement de la Vallee du Rhone, 30 - Bagnols-sur-Ceze (France)
Marcoule pilot plant, 12:15380 (R;FR)
Central Electricity Research Labs., Leatherhead (UK)
Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan)
Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)
Response of small laboratory animals to coal fly ash inhalation, 12:15344 (R;JP;In Japanese)
Central Research Inst. of Electric Power Industry, Komae, Tokyo (Japan). Energy and Environment Lab.
Plume washout and wet deposition of trace elements around the coal-fired power plant, 12:15318 (R;JP;In Japanese)
Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland)
Broadband magnetic and density fluctuations in the TCA tokamak, 12:17412 (R;CH)
Ceskoslovenska Komise pro Atomovou Energii, Prague
Application of ionizing radiation in food and feeds processing. Proceedings of seminar, 12:16844 (R;CS;In Czech)
Safety and operating reliability of the WWER reactor. Seismic load, 12:16038 (R;CS;In Czech)
Spectrometry and in core dosimetry of neutron radiation. Part I. Invited papers, 12:16619 (R;CS;In Czech)
Chevron Research Co., Richmond, CA (USA)
Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986, 12:15614 (R;US)
Chicago Univ., IL (USA). Dept. of Geophysical Sciences
Applications of synchrotron x-ray fluorescence to extraterrestrial materials, 12:16535 (R;US)
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
Trace element measurements using white synchrotron radiation, 12:16534 (R;US)
China Nuclear Information Centre, Beijing, BJ
Application of graphical design method to beam transport system, 12:16521 (R;CN;In Chinese)
Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory, 12:17254 (R;CN;In Chinese)
High-sensitive and quantitative in-line monitoring method for transplutonium elements separation processes, 12:15382 (R;CN;In Chinese)
Measurement of thermal-neutron-induced /sup 235/U fission spectrum by threshold detectors, 12:17255 (R;CN;In Chinese)
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Proton exciting X ray analysis. A new technique of trace element analysis in biomedicine, 12:16382 (R;CN;In Chinese)
Recovery of /sup 238/Pu from irradiated /sup 237/Np using anion exchange method, 12:15381 (R;CN;In Chinese)
Surface ionization ion source with high current, 12:16537 (R;CN;In Chinese)
Clarkson Univ., Potsdam, NY (USA)
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
College of William and Mary, Williamsburg, VA (USA)
HALOE science investigation. Semiannual progress report, February-July 1986, 12:16705 (R;US)
Colorado State Univ., Fort Collins (USA). Collaborative Radiological Health Lab.
Collaborative Radiological Health Laboratory annual report 1985: health effects of prenatal and postnatal whole-body exposure to ionizing radiation in the beagle dog, 12:16860 (R;US)
Colorado Univ., Boulder (USA)
Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987, 12:16423 (R;US)
Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro
Radioactive waste management in radioactive installations, 12:15412 (R;BR;In Portuguese)
Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

^{235}Uranium isotope abundance certified reference material for gamma spectrometry EC nuclear reference material 171 certification report, 12:16389 (R;FR)

Commission of the European Communities, Ispra (Italy). Joint Research Centre

Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems, 12:16385 (R;FR)

Commission of the European Communities, Luxembourg

Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

Chemical behaviour of Np, Pu and Am in various concentrated salt solutions, 12:16429 (R;FR;In German)

Comparison of material property specifications of austenitic steels in fast breeder reactor technology, 12:16273 (R;FR)

Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)

Decontamination of some liquid wastes of medium activity with a new solvent type, 12:15427 (R;FR;In Italian)

EC static high-temperature leach test. Summary report of an European Community interlaboratory round robin, 12:16358 (R;FR)

Experimental study of the recovery of plutonium from non-combustible wastes, 12:15429 (R;FR)

High-temperature incineration of radioactive waste. Exploitation of the FLK-60 slagging incinerator for the treatment of different waste streams contaminated with plutonium, 12:15428 (R;FR)

Laser Induced Photoacoustic Spectroscopy for the oxidation specific determination of actinoids in solution, 12:16388 (R;FR;In German)

Measurements of transuranium trace amounts in solution. Bibliographic study, 12:16387 (R;FR;In French)

Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems, 12:16385 (R;FR)

Processing of miscellaneous radioactive effluents by continuous flocculation decantation, 12:15426 (R;FR;In French)

Stress rupture properties of austenitic steel weld metals, 12:16271 (R;FR)

Survey of existing literature in the field of shock-absorbing materials with a view to subsequent adaptation of plastic deformation codes. Phase 1, 12:16442 (R;FR)

Tensile properties of austenitic steel weld metals, 12:16272 (R;FR)

^{235}Uranium isotope abundance certified reference material for gamma spectrometry EC nuclear reference material 171 certification report, 12:16389 (R;FR)

Commonwealth Scientific and Industrial Research Organization, Mount Waverley (Australia). Div. of Geomechanics

Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)

System for automatic monitoring of longwall supports at Angus Place colliery, 12:15321 (R;AU)

Commonwealth Scientific and Industrial Research Organization, Sydney (Australia)

Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)

Connecticut Univ., Storrs (USA)

Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)

Ground and excited state photoconductivity measurements of Ce^{3+}:YAG, 12:16352 (R;US)

UV laser induced photochromic centers in cerium doped calcium fluoride, 12:16351 (R;US)

Control Data Corp., Pleasanton, CA (USA)

Micro-to-Mainframe Communication Standard: Subsystem design analysis report, 12:17658 (R;US)

Council for Scientific and Industrial Research, Pretoria (South Africa). National Electrical Engineering Research Inst.

Battery-powered vehicle research in South Africa, 12:16233 (R;ZA)

D

Danmarks Tekniske Hoejskole, Lyngby

Electron cyclotron resonance heating of a high-density plasma, 12:17416 (R;DK)

Dartmouth Coll., Hanover, NH (USA). Dept. of Physics and Astronomy

High power, millimeter-wavelength, coherent radiation sources. Final report, 1 Februiary 1982-31 January 1986, 12:16487 (R;US)

Department of Atomic Energy, Bombay (India)

Annual report 1985-1986 [of the Department of Atomic Energy of the Government of India], 12:17636 (R;IN)

Department of Energy, London (UK). Wave Energy Steering Committee

Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)

Department of Transportation, Cambridge, MA (USA). Transportation Systems Center

National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983, 12:16210 (R;US)

National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report, 12:16211 (R;US)

National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement, 12:16212 (R;US)

National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982, 12:16214 (R;US)

National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980, 12:16213 (R;US)

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany, F.R.)

Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report, 12:15618 (R;DE;In German)

Deutsches Inst. fuer Wirtschaftsforschung, Berlin (Germany, F.R.)

Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)

Drexel Univ., Philadelphia, PA (USA). Dept. of Physics and Atmospheric Science

Non-accelerator particle physics: Progress report for period February 1, 1986-January 31, 1987, 12:17100 (R;US)

Duke Univ., Durham, NC (USA)

Nuclear interlevel transfer driven by collective outer shell electron oscillations, 12:17351 (R;US)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.

Hot canyon crane operating problems and equipment failures: F-Canyon Reprocessing Facility, Savannah River Plant, 12:15386 (R;US)

Long-term leaching behavior of simulated Savannah River Plant waste glass: Part 1, MCC-1 leachability results, four-year leaching data, 12:16356 (R;US)

Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)

Online plutonium x-ray fluorescence analyzer system in F-Canyon, 12:15376 (R;US)

Reprocessing fuel from the Southwest Experimental Fast Oxide Reactor at the Savannah River Plant, 12:15385 (R;US)

Using vision systems when bar code won't work, 12:17648 (R;US)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant

Interfacing solvent extraction in the recovery of pyrochemical residues at the Savannah River Plant, 12:15387 (R;US)

E

East Anglia Univ. (UK). Climatic Research Unit
Climatic data for Northern Hemisphere land areas 1851-1980, 12:16693 (R;US)
Surface air temperature anomalies for the Northern Hemisphere, 1881 - present, 12:16690 (R;GB)
East Carolina Univ., Greenville, NC (USA). Dept. of Mathematics
A stochastic approach to project planning in an R and D environment: Final report, 12:17633 (R;US)
Ecole Centrale des Arts et Manufactures, 92 - Chatenay-Malabry (France)
Behavior of an Inconel 718 container in the presence of hydrogen. Final report, 12:16270 (R;FR;In French)
Edinburgh Univ. (UK)
Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)
EG and G Energy Measurements, Inc., Las Vegas, NV (USA)
Role of the Federal Radiological Monitoring and Assessment Center (FRMAC) following a radiological accident, 12:16914 (R;US)
EG and G Idaho, Inc., Idaho Falls (USA)
Criticality safety evaluation for pathfinder fuel elements in model No. RA-3 shipping containers, 12:15398 (R;US)
Microstructural response of rapidly solidified 304 stainless steel powder to three consolidation techniques, 12:16269 (R;US)
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Preliminary results of the TMI-2 core bores, 12:16025 (R;US)
Reactivity analyses of Schlumberger samples, 12:16923 (R;US)
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)
TMI-2 lower vessel debris examinations, 12:16024 (R;US)
Virginia Power and Department of Energy spent fuel transportation experience, 12:15397 (R;US)
EG and G/Washington Analytical Services Center, Inc., Morgantown, WV (USA)
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)
Digital generation of stochastic signals of arbitrary spectral shape, 12:15925 (R;CH)
Eidgenoessische Technische Hochschule, Zurich (Switzerland)
Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Electricite de France, 75 - Paris
DER 85: main facts, 12:15798 (R;FR;In French)
Electric Power Research Inst., Palo Alto, CA (USA)
An approach to the verification of a fault-tolerant, computer-based reactor safety system: A case study using automated reasoning: Volume 2, Appendixes: Interim report, 12:16028 (R;US)
Application of the leak-before-break approach to BWR piping: Final report, 12:16029 (R;US)
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Corrosion-resistant coatings for low-pressure steam turbines: Final report, 12:15736 (R;US)
Downstream behavior of fission products, 12:15965 (R;US)
Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report, 12:15771 (R;US)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)
Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)
Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report, 12:16174 (R;US)
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Postaccident chemical decontamination: Method development: Final report, 12:16030 (R;US)
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
REEPS [Residual End-Use Energy Planning] code: User's guide, 12:16181 (R;US)
Roles of electricity: Electric steelmaking, 12:16220 (R;US)
Roles of electricity: Pulp and papermaking, 12:16219 (R;US)
Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)
Eloret Corp., Sunnyvale, CA (USA)
Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
Environmental Protection Agency, Research Triangle Park, NC (USA). Atmospheric Sciences Research Lab.
Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Monitoring and Systems Lab.
Precision and accuracy assessments for state and local air-monitoring networks, 1984, 12:16720 (R;US)
Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards
Air quality data - 1985 annual statistics including summaries with reference to standards. Annual report, 12:16712 (R;US)
Vinyl chloride standards: responses to comments on January 1985 proposed revisions, 12:16771 (R;US)
Erevanskij Fizicheskij Inst. (USSR)
Design principle and structure of the ANI data centre, 12:16609 (R;SU)
Electron scattering from light nuclei in the regions of quasi-elastic peak and Δ-isobar excitation, 12:17259 (R;SU)
On the question of Higgs boson production in heavy quarkonium decays, 12:17129 (R;SU)
Sandwich nuclear emulsion emitter-detector-emitter systems with regulated sensitivity, 12:16607 (R;SU;In Russian)
Time and amplitude characteristics of multiwire detectors, 12:16608 (R;SU;In Russian)
Ultra-high energy gamma-rays as the carriers of cosmological information, 12:16942 (R;SU)

Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Medizinische Fakultaet
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik
Nucleon-nucleon scattering in a nonrelativistic quark model, 12:17133 (R;DE;In German)
ESCA Corp., Bellevue, WA (USA)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)
ETS, Inc., Roanoke, VA (USA)
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
European Organization for Nuclear Research, Geneva (Switzerland)
Evolution of weak interactions, 12:17097 (R;XC)
The fifth force, 12:17126 (R;US)
Theoretical aspects of some collective instabilities in high-energy particle storage rings, 12:16590 (R;XC)
European Space Agency, 75 - Paris (France)
Measurement of radiation intensity at the solar tower plant SSPS/CRS of the IEA in Spain, 12:15621 (TG;FR)
European Space Research and Technology Centre, Noordwijk (Netherlands)
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
European Space Tribology Lab., Risley (UK)
Activities report in space tribology. Progress report, 1985, 12:16436 (R;GB)

F

Fachverband fuer Strahlenschutz e.V., Karlsruhe (Germany, F.R.). Arbeitskreis Dosismessung Externer Strahlung
New dose quantities for personnel dosemeters. Results of the intercomparison program 1985 - seminar report, 12:16649 (R;DE;In German)
Fermi National Accelerator Lab., Batavia, IL (USA)
Deflection analysis for an SSC [Superconducting Super Collider] dipole magnet with two external supports, 12:16551 (R;US)
Fermilab Central Computing Facility: Energy conservation report and mechanical systems design optimization and cost analysis study, 12:16550 (R;US)
Heavy flavors, 12:17155 (R;US)
Report of the working group on detector simulation, 12:16594 (R;US)
Shielding design at Fermilab: Calculations and measurements, 12:16549 (R;US)
Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)
Surface contouring with a range finder, 12:16812 (R;US)
Florida Univ., Gainesville (USA)
Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
Flow Industries, Inc., Kent, WA (USA)
Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation, 12:16725 (R;US)
Food and Drug Administration, Rockville, MD (USA)
FDA (Food and Drug Administration) compliance program guidance manual (FY 87). Section 4. Medical and radiological devices, 12:16911 (R;US)
Food and Drug Administration, Rockville, MD (USA). Center for Devices and Radiological Health
Joint CDRH (Center for Devices and Radiological Health) and state quality-assurance surveys in nuclear medicine: Phase 2 - radiopharmaceuticals, 12:16861 (R;US)
Selection of patients for x-ray examinations: skull x-ray examination for trauma, 12:16814 (R;US)
Forest Service, Asheville, NC (USA). Southeastern Forest Experiment Station
Atmospheric-dispersion index for prescribed burning. Forest Service research paper, 12:16728 (R;US)
Forest Service, Athens, GA (USA). Southeastern Forest Experiment Station
Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)
Forest Service, Grand Rapids, MI (USA). North Central Forest Experiment Station
Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)
Foth and Van Dyke and Associates, Inc., Green Bay, WI (USA). Waste/Energy Div.
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project, 12:15421 (R;US)
Frankfurt Univ. (Germany, F.R.). Inst. fuer Kernphysik
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik
Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)
Freiburg Univ. (Germany, F.R.). Forstwissenschaftliche Fakultaet
Problems of decision-making in the fields of biology and ecology under the aspect of environmental policy, 12:16157 (R;DE;In German)

G

Gas Research Inst., Chicago, IL (USA)
Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
GA Technologies, Inc., San Diego, CA (USA)
Maintenance features of the Compact Ignition Tokamak fusion reactor, 12:17432 (R;US)
GDC, Inc., Chicago, IL (USA)
The U-GAS process for producing gas from coal, 12:15275 (R;US)
General Electric Co., Largo, FL (USA). Neutron Devices Dept.
A bibliography and author index for electrical discharges in vacuum (1897-1984), 12:15667 (R;US)
General Electric Co., San Jose, CA (USA). Nuclear Energy Business Operations
Application of the leak-before-break approach to BWR piping: Final report, 12:16029 (R;US)
General Electric Co., Schenectady, NY (USA)
Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report, 12:16174 (R;US)
General Electric Co., Sunnyvale, CA (USA)
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
Georgia Univ., Athens (USA)
Sediment transport characteristics of the nearshore zone between Hilton Head and Ossabaw Islands, Georgia as determined by heavy mineral analysis, 12:16934 (R;US)
Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)
GRS annual report 1985, 12:17635 (R;DE;In German)
Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)
Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22, 12:17071 (R;DE)
Development of an universal particle telescope with large dynamics for light and medium heavy fragments, 12:16612 (R;DE;In German)

Sub-barrier fusion, 12:17261 (R;DE)
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz
Environmental radioactivity and radiation exposure in southern Bavaria after the Chernobyl accident, 12:16768 (R;DE;In German)
Giessen Univ. (Germany, F.R.). Inst. fuer Kernphysik
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
Goettingen Univ. (Germany, F.R.). Forschungszentrum Waldoekosysteme - Waldsterben
Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils, 12:16775 (R;DE;In German)
Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)
Investigations in the toxic effect of H ions and Al ions on seedlings of spruce (Picea abies, KARST.) and beech (Fagus sylvatica, L.) in a solution culture, 12:16903 (R;DE;In German)
Goldenrod Hills Community Action Agency, Walthill, NE (USA). Tri-County Council
Study of the feasibility of the commercial production of refuse derived fuel, 12:15595 (R;US)
Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)
Difference equation of neutron thermalization in vibrational-nonequilibrium medium, 12:17311 (R;SU;In Russian)
Experimental investigation of closed-type convective thermosyphon thermal performance as applied to a molten salt power reactor, 12:15836 (R;SU;In Russian)
Mathematical simulation of fuel materials swelling according to a quasistatic void model, 12:16331 (R;SU;In Russian)
Nuclear power safety economics, 12:15870 (R;SU;In Russian)
On the stability of superconducting systems under slightly chance thermal perturbations, 12:17355 (R;SU;In Russian)
Quenching rates in 7-rod bundle of zirconium alloy at emergency cooling parameters of WWER, 12:16032 (R;SU;In Russian)
Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki
Anti νn and anti νp interactions in neon nucleus: total cross section ratio and quark-parton analysis, 12:17115 (R;SU)
Correlations between neutrons with small relative momenta produced in p-Pb interactions at 7,5 GeV/c, 12:17238 (R;SU)
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Equations of one-dimensional radiative hydrodynamics with thermal conductivity and kinetics of thermonuclear burning, 12:17436 (R;SU;In Russian)
Experimental comparison of EMC effect in the anti νn and anti νp interactions in neon nucleus, 12:17114 (R;SU)
Inclusive cross sections of π/sup +/, p, /sup 2/H, /sup 3/H, / sup 3/He yields at angle 3.5 deg in 6.37 and 8.08 GeV/c proton interactions with Be, Al, Cu, Ta nuclei, 12:17197 (R;SU;In Russian)
Instantons versus SUSY, 12:17165 (R;SU)
Isotope and isotonic effects in nucleon inclusive production at high energies, 12:17198 (R;SU;In Russian)
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17366 (R;SU;In Russian)
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17367 (R;SU;In Russian)
Multiinstantons and monopoles in SU(2) gluodynamics, 12:17166 (R;SU)
On (quasi) stable gluino, 12:17143 (R;SU)
On the anomalous supermultiplet in th Wess-Zumino model, 12:17164 (R;SU;In Russian)
On the particle capture cross section in the Schwarzschild metric, 12:17369 (R;SU;In Russian)
On the types of unbounded orbits in Kerr metric, 12:17365 (R;SU;In Russian)
Once again about the role of gluonic mechanism in interaction of light Higgs boson with hadrons, 12:17144 (R;SU)
Quarks degrees of freedom and deuteron static moments, 12:17287 (R;SU)
Radiation gasodynamics equations in the tetrad form for astrophysical applications, 12:17368 (R;SU;In Russian)
Secondary particle multiplicity in the π/sup -/Ne interactions at psub(π)=6.2 Gev/c, 12:17215 (R;SU;In Russian)
Some topological characteristics of π/sup -/meson interactions with nuclei, 12:17199 (R;SU;In Russian)
Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)
Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.
Collective excitation of a target by high-density electron beam, 12:17308 (R;SU;In Russian)
Investigation of time evolution of leakage neutron spectra from the surface of a molybdenum sphere in the nanosecond range, 12:17309 (R;SU;In Russian)
Measurement of inelastically scattering neutron spectra from the (n,n'γ) reaction on iron nuclei, 12:17213 (R;SU;In Russian)
Memory division module MDP.2, 12:16671 (R;SU;In Russian)
On the method of separation of regions in the framework of the neutron transport theory, 12:17310 (R;SU;In Russian)
Resolution of spectrometric systems of various types. Problem statement, 12:16610 (R;SU;In Russian)
Temperature dependence of the generalized frequency water spectrum, 12:17307 (R;SU;In Russian)
Temperature-dose dependences of porosity parameters in nickel irradiated by 1 meV nitrogen ions, 12:16274 (R;SU;In Russian)
Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij
Approach to calculation of the infrared region contribution to vacuum expectation values of gluonic and quark fields, 12:17163 (R;SU)
Baryon string model. Part 3. Quantum theory of single-mode configurations of three-string, 12:17361 (R;SU;In Russian)
Cherenkov radiation ring spectrometers with hodoscopic photomultipliers for measurement of particle velocity with momentum up to 300 GeV/c, 12:16613 (R;SU;In Russian)
Do multinucleon clusters exist in a nucleus, 12:17262 (R;SU)
Experiment to study the gluon interactions and glueball production in the central region of hadron collisions at UNK energies (2-3 TEV), 12:17103 (R;SU)
Gravitational collapse in relativistic theory of gravitation, 12:17362 (R;SU;In Russian)
HF-field stabilization in the booster injector debuncher, 12:16552 (R;SU;In Russian)
High-intensity proton beam formed onto internal target of the IHEP accelerator, 12:16553 (R;SU;In Russian)
Hodoscope photomultipliers and their application in particle detectors, 12:16614 (R;SU;In Russian)
Leptoproduction of nuclei as an analogue to production in hadron-hadron interactions (at the example of J/psi), 12:17131 (R;SU)
Low-energy neutron spectra behind the IHEP accelerator shields, 12:16556 (R;SU;In Russian)
Model of nonrelativistic quarks in self-consistent field, 12:17130 (R;SU;In Russian)
Problems of CP-violation in early unification theories, 12:17162 (R;SU)
Radial distributions of shower energy deposition in hadron and photon hodoscopic sandwich-type calorimeters with cell structure, 12:16616 (R;SU;In Russian)
Rectangular drift tube characteristics, 12:16617 (R;SU)
Relativistic positronium channel at the IHEP accelerator, 12:16555 (R;SU;In Russian)
Scalar multiplets in N=2 supergravity, 12:17360 (R;SU;In Russian)
Setup for studying targets irradiated by high density proton beam, 12:16554 (R;SU;In Russian)
Study of light pulse shape from polystyrene scintillators, 12:16615 (R;SU;In Russian)
Study on the inclusive neutrino (antineutrino) interactions with nuclei at 3-30 GeV, 12:17105 (R;SU;In Russian)
Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c, 12:17104 (R;SU;In Russian)
Systematic errors in field measurements in a hf quadrupole focusing accelerator, 12:16524 (R;SU;In Russian)
Using pulse fall of a drift proportional tube for time resolution improvement, 12:16618 (R;SU;In Russian)
Grambling State Univ., LA (USA). Dept. of Physics
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)

Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)
Fusion with projectiles form carbon to argon at energies between 20A and 60A MeV, 12:17243 (R;FR)
Multiplicity dependent light particle correlations in ^{40}Ar + ^{197}Au reaction at E/A = 60 MeV°, 12:17236 (R;FR)
Particle emission but also fission in the decay of very excited nuclei, 12:17260 (R;FR)
Search for impact parameter dependence of two-particle correlations using exclusive observables in nucleus-nucleus collisions at intermediate energies, 12:17219 (R;FR)
Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules
Higgs boson production by W and Z collisions, 12:17153 (R;FR)
Magnetic monopoles: from classical to quantum physics, 12:17154 (R;FR)
Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires
Random phase approximation, 12:17286 (R;FR)

H

Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)
An overview of low-energy ion-atom collisions, 12:17067 (R;US)
Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kern- und Strahlenphysik
HMI Section of Nuclear and Radiation Physics - Annual report 1985, 12:17194 (R;DE;In German and English)
Hanford Engineering Development Lab., Richland, WA (USA)
Corrosion of copper-based materials in gamma radiation, 12:16275 (R;US)
Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
Fracture toughness of stainless steel welds, 12:16278 (R;US)
Interfacing robotics with plutonium fuel fabrication, 12:15377 (R;US)
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
Radiation embrittlement of manganese-stabilized martensitic stainless steel, 12:16276 (R;US)
Reactor cover gas monitoring at the Fast Flux Test Facility, 12:15984 (R;US)
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
The Solid Waste Transfer Pit an FFTF [Fast Flux Test Facility] station for fuel and reflector transfer, 12:15983 (R;US)
Hannover Univ. (Germany, F.R.). Fachbereich Chemie
Origins of the Messel oil shale and structure of petroporphyrins, 12:15372 (R;DE;In German)
Harris Semiconductor, Melbourne, FL (USA)
Characterization of on-chip polycrystalline silicon photoconductors, 12:16492 (R;US)
Harvard Univ., Cambridge, MA (USA)
Analysis of picosecond pulsed laser melted graphite, 12:17352 (R;US)
Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.
Electron ion collisions with a heavy ion cooler ring, 12:17065 (R;US)
The Heidelberg test storage ring for heavy ions and its use for atomic physics, 12:16591 (R;US)
Helipump, Inc., Brecksville, OH (USA)
CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)
Hessisches Ministerium fuer Wirtschaft und Technik, Wiesbaden (Germany, F.R.)
Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation, 12:15670 (R;DE;In German)
Hoofdgroep Maatschappelijke Technologie TNO, Apeldoorn (Netherlands)
On the mutagenicity of fly ash samples from the PGEM power plant 'Gelderland' at Nijmegen, as determined with the Ames test, 12:15319 (R;NL;DU)
Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics
Asymptotic behaviour of Robinson-Trautman pure radiation solutions, 12:17385 (R;HU)
Comment to the reanalysis of the Eoetvoes experiment, 12:17382 (R;HU)
Cosmic ray fluctuations at rigidities 4 to 180 GV, 12:16962 (R;HU)
Coulomb pair-creation, 12:17384 (R;HU)
External field Dirac equation with separable potential, 12:17383 (R;HU)
Icy-glue model of cometary nuclei, 12:16960 (R;HU)
Measurement of reactivity temperature coefficient by noise method in a power reactor, 12:15802 (R;HU)
Monopole abundance from first order GUT phase transition of the early Universe, 12:16961 (R;HU)

I

Illinois Inst. of Tech., Chicago (USA). Dept. of Physics
Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)
Illinois Univ., Chicago (USA). Dept. of Physics
Physical processes at high field strengths, 12:17066 (R;US)
Illinois Univ., Urbana (USA). Dept. of Astronomy
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Imperial Coll. of Science and Technology, London (UK)
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Information and Control Systems, Inc., Hampton, VA (USA)
Space-based laser-driven MHD generator: feasibility study. Final report, 12:16187 (R;US)
Institute for Energy Analysis, Washington, DC (USA)
Global energy and carbon dioxide, 12:16701 (R;US)
Institute of Gas Technology, Chicago, IL (USA)
Applications of economic analysis in gas distribution, 12:15368 (R;US)
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
Energy from biomass and wastes: 1985 update, 12:15599 (R;US)
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)
Recent developments in wet carbonization of peat, 12:15274 (R;US)
The U-GAS process for producing gas from coal, 12:15275 (R;US)
Institute of Nuclear Physics, Krakow (Poland)
Studies of aluminum in rat brain, 12:16884 (R;US)
Institut fuer Angewandte Oekologie, Darmstadt (Germany, F.R.). Projektgruppe Reaktorsicherheit
Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian Ministry of State for Regional Development and Environmental Affairs, 12:15388 (R;DE;In German)
Probabilistic safety analysis for Sizewell B - Proof of Evidence, established on behalf of the Friends of the Earth, London, within the framework of the Sizewell B Power Station Public Inquiry, 12:16036 (R;DE;In German, English)
Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)
Density of states due to pairing of impurities in semiconductor systems, 12:16359 (R;BR)
Intera Technologies, Inc., Austin, TX (USA)
A modeling study of the Culebra dolomite, 12:16921 (R;US)
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
International Atomic Energy Agency, Vienna (Austria)
Atomic Energy Authority Act 1986, 12:17682 (R;GB)
Aviation Regulation OPS M1-18 on the Transport of Dangerous Goods by Air, 12:15576 (R;FI;In Finnish)

Costs and financing of nuclear power programmes in developing countries. Proceedings of a seminar held in Vienna, 9-12 September 1985, 12:15881 (R;XA)
Council of State decision relating to examinations under Section 5 of the Radiation Protection Act (No. 243/58), 12:15573 (R;FI;In Finnish)
Decision of the National Board of Navigation on the Carriage of Dangerous Goods in Ships, 12:15575 (R;FI)
Decision on radiation protection of 5.11.1968/594, 12:15571 (R;FI;In Finnish)
Decree bringing into force the Nuclear Liability Act (No. 486/72), 12:16058 (R;FI;In Finnish)
Decree relating to the annual leave of persons working under harmful radiation conditions (No. 175/67), 12:15572 (R;FI;In Finnish)
Decree relating to the competence of the National Board of Health to issue permits under the Radiation Protection Act, 5.2.1959/47, 12:17684 (R;FI;In Finnish)
Decree setting up the Atomic Energy Commission, as amended (No. 76/58), 12:17685 (R;FI;In Finnish)
Fusion safety status report, 12:17434 (R;XA)
Impact desorption cross section studies of impurity release into magnetically confined plasmas. Final report for the period 1 July 1982-31 December 1985, 12:17433 (R;XA)
International Centre for Theoretical Physics. Scientific activities in 1985, 12:17195 (R;XA)
Introduction to cost-effectiveness analysis of risk reduction measures in energy systems, 12:15904 (R;XA)
Limiting the liability of the nuclear operator, 12:16059 (R;XN;In English and French)
Ministerial Decision No. 116 on the export of some materials, equipment and devices in the field of Atomic Energy, 12:15574 (R;FI;In Finnish)
Nuclear Liability Act as amended (No. 484/72), 12:16057 (R;FI)
Radiation Protection Act 26.4.1957/174, 12:15569 (R;FI;In Finnish)
Radiation Protection Decree 27.9.1957/328, 12:15570 (R;FI;In Finnish)
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)
Technology and use of low power research reactors. Report of a consultants' meeting held in Beijing, China, 30 April-3 May 1985, 12:15985 (R;XA)
Transport of dangerous substances by road, 12:15399 (R;FI;In Finnish)
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
Two example applications of optimization techniques to radiation protection programmes of United States Department of Energy Contractors, 12:17333 (BA;XA)

International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee
Calculation of the energy spread and the average neutron energy of 14 MeV neutrons produced via the T(d,n)/sup 4/He reaction in solid Ti-T targets, 12:17312 (R;XA)
Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986, 12:17196 (R;XA)

Iowa Univ., Iowa City (USA)
Intense lithium ion beam diagnostic using the inverse nuclear reactor D(^{7}Li,n)^{8}Be, 12:17487 (R;US)

IT Corp., Albuquerque, NM (USA)
Laboratory investigation of crushed salt consolidation and fracture healing, 12:16925 (R;US)

I. T. Corp., Carlsbad, NM (USA)
1986 annual water quality data report for the Waste Isolation Pilot Plant, 12:15488 (R;US)

J

Jaderna Elektrarna, Dukovany (Czechoslovakia)
Safety work organization in nuclear power plant. A9. Volume 1, 12:17637 (R;CS;In Czech)
Safety work organization in nuclear power plant. A9. Volume 2. Annexes, 12:17638 (R;CS;In Czech)

Japan Atomic Energy Research Inst., Tokyo
Report of the joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators (II), 12:17200 (R;JP)

Jednota Ceskoslovenskych Matematiku a Fyziku, Prague
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)

Jet Propulsion Lab., Pasadena, CA (USA)
Chemical bonding technology: Direct investigation of interfacial bonds, 12:15604 (R;US)
Environmental tests of metallization systems for terrestrial photovoltaic cells, 12:15603 (R;US)
Ink jet printing of silver metallization for photovoltaics: Final technical report for the period 10/1/84 through 9/30/86, 12:15607 (R;US)
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
Silicon production in a fluidized bed reactor: Final report, 12:15606 (R;US)
Solar Stirling receiver alternatives for the terrestrial solar application, 12:15619 (R;US)
Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)
The SIMRAND I computer program: Simulation of research and development projects, 12:17647 (R;US)
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)

Joint Inst. for Nuclear Research, Dubna (USSR)
Analysis of elastic scattering in anti pp interactions at 22.4 GeV/c, 12:17117 (R;SU;In Russian)
γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem, 12:17211 (R;SU)

Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods
Investigation of spatial resolution of plastic streamer tubes, 12:16635 (R;SU;In Russian)
On tolerances for random perturbations of accelerating electric field in the KUTI-20 induction accelerating system (LUEhK-20), 12:16526 (R;SU;In Russian)
Pulse voltage generator for electron cannon supply, 12:16560 (R;SU;In Russian)
Relativistic theory of forming space charge laminar flows, 12:17178 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety
Energy dependence of some neutron dosimeter sensitivities in the 1 eV up to 4 keV energy range, 12:16641 (R;SU;In Russian)
Influence of different detector parameters on the neutron sensitivity of OSL-detectors, 12:16634 (R;SU)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation
Approximate calculation of the conditional Wiener integral in quantum mechanics problem. Anharmonic oscillator, 12:17381 (R;SU;In Russian)
Approximate calculation of the conditional Winer integral in quantum mechanics problems. Harmonic oscillator, 12:17380 (R;SU;In Russian)
DECAN program for determinining parameters of exponential distributions in experiments on the genetically linked radionuclide investigation, 12:17649 (R;SU;In Russian)
Dialogue scanning measuring systems, 12:16637 (R;SU;In Russian)

Joint distributions of observables and measures with infinite values, 12:17376 (R;SU)
Program for smooth approximation of a function of two variables, 12:15961 (R;SU;In Russian)
Quadrupole lense field potential determination by the boundary integral eguation method, 12:16527 (R;SU;In Russian)
Realization of one algorithm for track elements isolation in analyzing the images of nuclear interactions, 12:16638 (R;SU;In Russian)
Solution of Faddeev differential equations for scattering problem in three identical particle system. Calculation algorithm. The finite-dimensional approximation method, 12:17177 (R;SU;In Russian)
TV event recorder, 12:16630 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy

Λ hyperon and K/sup 0/ meson production in Cp and CC interactions at 4.2 GeV/c per nucleon, 12:17116 (R;SU;In Russian)
A-dependence of production cross section of the Nsub(PHI) narrow baryon resonance, 12:17118 (R;SU;In Russian)
Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
On permissible space anisotropy, 12:17379 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics

Application of neutron time-of-flight diffraction to texture studies, 12:16280 (R;SU)
Investigation of pattern recognition algorithm to classify the IBR-2 reactor noise spectra, 12:15995 (R;SU;In Russian)
Measuring module of an apparatus for polarization analysis of ultracold neutrons on the base of microcomputer, 12:16639 (R;SU;In Russian)
Neutron diffractometer at the IBR-2 reactor. Control system for four-circle goniometer, 12:16484 (R;SU;In Russian)
Stability of a periodically pulsed reactor, 12:15960 (R;SU;In Russian)
Transfer function of a periodically pulsed reactor, 12:15959 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems

Analog-to-digital converter, 12:16631 (R;SU;In Russian)
Application of quasi-random numbers for simulation, 12:17650 (R;SU;In Russian)
Mass formula for multibaryon resonances and prediction of a new stable baryon, 12:17146 (R;SU)
On relative detection efficiency of a channel electron multiplier for electrostatic beta spectrometer, 12:16636 (R;SU;In Russian)
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)
Readout method for wire chambers, 12:16633 (R;SU;In Russian)
Three methods to determine the yields of DNA double-strand breaks, 12:16858 (R;SU)
Time planar HPGe detectors, 12:16632 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions

Control and data acquisition system of the RIPS facility for the plastic property irradiation studies, 12:16483 (R;SU;In Russian)
Double-arm time-of-flight spectrometer for the DEMAS installation, 12:16629 (R;SU;In Russian)
Electrostatic separator of total fusion reaction products in the heavy ion beam of Vasilisa installation, 12:16640 (R;SU;In Russian)
Half-lives and kinetic energies for the spontaneously emitted heavy ions from nuclei, 12:17292 (R;SU)
Some proposals on mass separation, precision mass spectrometry and acceleration of radioactive nuclides, 12:16561 (R;SU;In Russian)
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics

Approximate two-soliton solution of a generalized Schroedinger equation in nuclear hydrodynamics, 12:17375 (R;SU)
Bag model from the preons, 12:17150 (R;SU;In Russian)
Basic equations of the quasiparticle-phonon nuclear model for deformed even-even nuclei, 12:17296 (R;SU;In Russian)
Closer of the chain of kinetic equation moments and description of the negative-parity collective excitations, 12:17295 (R;SU;In Russian)
Construction of finite N=1 supersymmetric Yang-Mills theories, 12:17159 (R;SU)
Dualities in the d=2 asymmetric chiral field sigma models, 12:17171 (R;SU)
Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering, 12:17152 (R;SU;In Russian)
Fermionic string model in spaces of Lie group, 12:17176 (R;SU;In Russian)
Fock representation for quaternion fields, 12:17173 (R;SU;In Russian)
Gluon bremsstrahlung in supersymmetric QCD, 12:17148 (R;SU;In Russian)
Higher hypercomplex numbers and quantum mechanics, 12:17373 (R;SU)
Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory, 12:17170 (R;SU)
Investigation of two-phonon pole shift in deformed nuclei by the boson expansion method, 12:17291 (R;SU)
Is it necessary to prove the "potential" confinement in QCD, 12:17174 (R;SU;In Russian)
Kronecker products which decompose into two irreducible representations, 12:17374 (R;SU)
Metric nature of spinor field, 12:17175 (R;SU;In Russian)
Natural coordinates for the three-body problem in adiabatic approximation, 12:17378 (R;SU;In Russian)
On pair production of Majorana particles in collisions of polarized e/sup +/ and e/sup -/, 12:17147 (R;SU;In Russian)
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
Quantum principles in field interactions, 12:17172 (R;SU;In Russian)
Quasiparticle-phonon nuclear model, 12:17290 (R;SU)
Semileptonic decays of ordinary and charmed Λ/sup +/sub(c) baryons in chiral theory, 12:17145 (R;SU)
Statistical methods of the description of quark degrees of freedom, 12:17294 (R;SU;In Russian)

K

Kansas State Univ., Manhattan (USA). Dept. of Physics

An overview of low-energy ion-atom collisions, 12:17067 (R;US)
Atomic physics of strongly correlated systems: Progress report, 1 August 1984 through 31 July 1985, 12:17068 (R;US)
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)

Kansas Univ., Lawrence (USA). Dept. of Physics and Astronomy

Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)

Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Bio- und Geowissenschaften

Experimental investigations of the reaction between albite and acid hydrothermal solutions, 12:15629 (R;DE;In German)

Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau

Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)

Kassel Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich 19 - Biologie, Chemie

Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)

KEK, Oho-machi, Ibaraki-ken (Japan)

Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)

Kentucky Univ., Lexington (USA)

Research in theoretical nuclear physics: Annual report, 1985/1986, 12:17258 (R;US)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)
Analysis of materials (metals, ceramics, minerals) using spectroscopic methods, 12:16390 (R;DE)
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Programmgruppe Systemforschung und Technologische Entwicklung
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)
HDR [Heissdampfreaktor] Phase 2 vibrational experiments, 12:16020 (R;US)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Ingenieurtechnik
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung
Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Meteorologie und Klimaforschung
Evaluation of tetroon flights and turbulent diffusion under weak wind conditions during the field experiment SIESTA, 12:16688 (R;DE)
Influence of stability classification on atmospheric diffusion calculations for elevated releases over a terrain of major roughness, 12:16687 (R;DE)
Report on the comparison of measurements between two monostatic Doppler-SODAR's manufactured by REMTECH, 12:16686 (R;DE;In German)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik
Principles and techniques of data evaluation, 12:17651 (R;DE)
Velocity and turbulence distributions in wall subchannels of a rod bundle with a spacer grid, 12:16475 (R;DE;In German)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie
Analytical instruments at the Institute of Radiochemistry, 12:16430 (R;DE;In German)
Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)
Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid, 12:16404 (R;DE;In German)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung
Automatic path-planning for a multilink articulated boom within the torus of a fusion reactor, 12:17438 (R;DE)
Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Kernfusion
Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter
Principles and techniques of data evaluation, 12:17651 (R;DE)
Velocity and turbulence distributions in wall subchannels of a rod bundle with a spacer grid, 12:16475 (R;DE;In German)
Kingston, Reynolds, Thom and Allardice Ltd., Auckland (New Zealand)
Land suitability and availability for energy farming: a regional study Phase 2 report. Final report, 12:15609 (R;US)
Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Korea Advanced Energy Research Inst., Seoul (Republic of Korea)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
KVB, Inc., Irvine, CA (USA)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln, 12:15314 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)
Kyoto Univ. (Japan)
Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.
Proceedings of the specialist research meeting on measurements of short-lived isotopes, 12:16646 (R;JP;In Japanese)

L

Lawrence Berkeley Lab., CA (USA)
Coupled processes in single fractures, double fractures and fractured porous media, 12:16919 (R;US)
Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines, 12:15760 (R;US)
ECR [Electron Cyclotron Resonance] ion sources for cyclotrons, 12:16567 (R;US)
H^- ion source scaling studies at LBL, 12:16566 (R;US)
Heater induced quenches in SSC [Superconducting Super Collider] model dipoles, 12:16565 (R;US)
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
String theory and holomorphic line bundles, 12:17180 (R;US)
Ventilation and occupant behavior in two apartment buildings, 12:16203 (R;US)
Lawrence Livermore National Lab., CA (USA)
A diffusion operator for Lagrangian meshes, 12:17659 (R;US)
A laser Doppler method for noninvasive measurement of flow velocity, 12:16478 (R;US)
Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)
Assay products from Green River oil shale, 12:15373 (R;US)
Computer science research: Computation directorate, 12:17657 (R;US)
Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)
Energy and Technology Review, November 1986, 12:17488 (R;US)
Filter penetration measurements using the condensation nuclei counter and the aerosol photometer, 12:16916 (R;US)
Integrated optical devices for high speed diagnostics, 12:16493 (R;US)
Laser welding metallography, 12:16299 (R;US)
Micro-to-Mainframe Communication Standard: Subsystem design analysis report, 12:17658 (R;US)
Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)
Nuclear explosives for peaceful purposes, 12:16683 (R;US)
Nuclear weapon R and D and the role of nuclear testing, 12:16684 (R;US)
On the degree of verification needed to support a comprehensive test ban, 12:16685 (R;US)
Personnel neutron dosimetry using CR-39 foils, 12:16879 (R;US)
Powered air-purifying respirator study: Final report, 12:16915 (R;US)
Reference waste package environment report, 12:15451 (R;US)
Review of progress in the theory of volume production, 12:17083 (R;US)
The Computational Physics Program of the National MFE Computer Center, 12:17417 (R;US)

The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
The operator interface for the Mirror Fusion Test Facility, 12:17489 (R;US)
Leech Lake Reservation Business Committee, Cass Lake, MN (USA)
Crystalline Repository Project: Review and comment of the Leech Lake Reservation Business Committee: Draft area recommendation report, 12:15420 (R;US)
Lehigh Univ., Bethlehem, PA (USA)
The role of point defects on structural phase transitions: Progress report for the year 1986-1987, 12:16355 (R;US)
Levy (S.), Inc., Campbell, CA (USA)
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
Lim and Orzechowski Associates (USA)
LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis, 12:15565 (R;US)
Linkoeping Univ. (Sweden). Dept. of Radiation Physics
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
London Nuclear Ltd., Niagara Falls, Ontario (Canada)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Los Alamos National Lab., NM (USA)
A self-similar approach to the explosion of droplets by a high energy laser beam, 12:17386 (R;US)
Analysis of picosecond pulsed laser melted graphite, 12:17352 (R;US)
Characterization of on-chip polycrystalline silicon photoconductors, 12:16492 (R;US)
Factors limiting the operation of structures under high gradient, 12:16528 (R;US)
Field test and calibration of neutron coincidence counters for high-mass plutonium samples, 12:16647 (R;US)
Fran Ridge horizontal coring summary report hole UE-25h No. 1, Yucca Mountain Area, Nye County, Nevada, 12:16918 (R;US)
Fundamental data analyses for measurement control, 12:15564 (R;US)
GaAs photoconductors to characterize picosecond response in GaAs integrated devices and circuits, 12:16491 (R;US)
General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)
High-brightness rf linear accelerators, 12:16513 (R;US)
[International conference and symposium on unified concepts of many-body problems]: Symposium summary, 12:17298 (R;US)
Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)
LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis, 12:15565 (R;US)
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
Modeling of buried explosions, 12:16678 (R;US)
More on the first order chiral symmetry transition in QCD, 12:17160 (R;US)
Nonlinear RR Lyrae models with time dependent convection, 12:16964 (R;US)
Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
Nuclear interlevel transfer driven by collective outer shell electron oscillations, 12:17351 (R;US)
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Opacity calculations for laser plasma applications, 12:17411 (R;US)
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Plasma energy balance model for optical-laser-induced impulse in vacuo, 12:16466 (R;US)
Pulsations of white dwarf stars with thick hydrogen or helium surface layers, 12:16963 (R;US)
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
Requirements for charged-particle reaction cross sections in the d-d, d-t, t-t, and d-^{3}He fuel cycles, 12:17484 (R;US)
Spectroscopic investigation of H^- and D^- ion source plasmas, 12:16564 (R;US)
Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
Supersymmetry and model building, 12:17179 (R;US)
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
The evaluation and application of redundant-cross-section covariances, 12:17202 (R;US)
The Low-Q Diffractometer at the Los Alamos Neutron Scattering Center, 12:16648 (R;US)
The spatial dependence of spin and charge correlations in a one-dimensional, single impurity, Anderson model, 12:17350 (R;US)
Louisiana State Univ., Baton Rouge (USA). Dept. of Physics and Astronomy
The structure of nuclei far from beta stability: Progress report for the period May 15, 1986 to May 14, 1987, 12:17193 (R;US)
Louvain Univ. (Belgium). Lab. voor Vaste Stof-Fysika en Magnetisme
Nature of coupling and dimensional crossover in superconducting multilayers, 12:17354 (R;US)
Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire
Temperature influence during nitrogen implantation into steel, 12:16286 (R;FR)

M

Maine Univ., Orono (USA)
New England solar energy atlas, 12:15596 (R;US)
Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)
How to set up a successful production graphics facility, 12:17642 (R;US)
Inertia friction welding of 1100 aluminum to type 316 stainless steel, 12:16295 (R;US)
Maryland Univ., College Park (USA)
Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86, 12:15302 (R;US)
Maryland Univ., College Park (USA). Dept. of Chemical and Nuclear Engineering
An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)
Massachusetts General Hospital, Boston (USA). Radiology Dept.
Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials, 12:16327 (R;US)
Massachusetts Inst. of Tech., Cambridge (USA)
Ab-initio determination of the structure of a grain boundary by simulated quenching, 12:16354 (R;US)
Analysis of picosecond pulsed laser melted graphite, 12:17352 (R;US)
Lattice imaging study of grain boundaries at normal incidence to the boundary plane, 12:16267 (R;US)
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report], 12:16420 (R;US)
Theoretical investigation of twist boundaries in germanium, 12:16266 (R;US)
Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering
Calculation of the properties of vacancy clusters in copper using a new, efficient energy minimization scheme, 12:16251 (R;US)
Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Assessment of silicon-on-insulator technologies for VLSI (very large scale integration), 12:16486 (R;US)
Electron-pumped high-efficiency semiconductor laser, 12:16462 (R;US)

Massachusetts Univ., Amherst (USA)
Climatic data for Northern Hemisphere land areas 1851-1980, 12:16693 (R;US)
Massachusetts Univ., Amherst (USA). Dept. of Mechanical Engineering
Erosion damage in glass and alumina, 12:16330 (R;US)
Massachusetts Univ., Amherst (USA). Water Resources Research Center
Design of a drinking-water-quality monitoring program, 12:16783 (R;US)
Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (Germany, F.R.)
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.)
Lattice imaging study of grain boundaries at normal incidence to the boundary plane, 12:16267 (R;US)
Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)
Evolution of radiation power profiles in ASDEX H-mode discharges, 12:17407 (R;DE)
Method to measure the suprathermal density distribution by electron cyclotron emission, 12:17406 (R;DE)
Surface analysis of a central part of the JET graphite limiter, 12:17435 (R;DE)
McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)
10 MWe Solar Thermal Central Receiver Pilot Plant control system description, 12:15620 (R;US)
McGraw-Edison Power Systems Div., Franksville, WI (USA). Thomas A. Edison Technical Center
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)
Meridian Corp., Falls Church, VA (USA)
Evaluation of international photovoltaic projects: Volume 1, Executive summary, 12:15616 (R;US)
Metz Univ., 57 (France). Faculte des Sciences
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
Michigan State Univ., East Lansing (USA). Dept. of Computer Science
Toward formal analysis of ultra-reliable computers: A total systems approach, 12:17644 (R;US)
Michigan State Univ., East Lansing (USA). Dept. of Physics
Magnetic phase transitions in nanocrystalline erbium, 12:16255 (R;US)
Michigan Technological Univ., Houghton (USA). Dept. of Metallurgical Engineering
Stress corrosion cracking and metal-induced embrittlement: Comparative studies of local chemistries: Progress report for period September 1, 1986-January 15, 1987, 12:16268 (R;US)
Michigan Univ., Ann Arbor (USA)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)
Observational study of ion-electron equilibration and of cloud evaporation in supernova remnants under the HEAO-2 guest investigator program. Final project report, 1 June 1985-30 September 1986, 12:17036 (R;US)
Michigan Univ., Ann Arbor (USA). Dept. of Atmospheric and Oceanic Science
Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)
Military Academy, West Point, NY (USA)
Characterization of on-chip polycrystalline silicon photoconductors, 12:16492 (R;US)
Mille Lacs Band of Chippewa Indians, Onamia, MN (USA)
Draft area recommendation report for the Crystalline Repository Project: Comments: Final technical report, 12:15419 (R;US)
Minerals Management Service, Washington, DC (USA)
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Ministerium fuer Umwelt und Gesundheit des Landes Rheinland-Pfalz, Mainz (Germany, F.R.)
Is waste incineration feasible. Result of experts' discussion on a waste management concept for the south western and southern Palatinate. 2. Ed. , 12:16225 (R;DE;In German)
Ministry of Nuclear Industry, Taiyuan, SX (China). Inst. of Radiation Protection
Evaluation of tetroon flights and turbulent diffusion under weak wind conditions during the field experiment SIESTA, 12:16688 (R;DE)
Influence of stability classification on atmospheric diffusion calculations for elevated releases over a terrain of major roughness, 12:16687 (R;DE)
Mississippi State Univ., Mississippi State (USA). MHD Energy Center
Testing and evaluation of heat recovery/seed recovery: Annual technical progress report, april 1981-March 1982, 12:16186 (R;US)
Missouri Univ., Kansas City (USA). Dept. of Physics
Theoretical studies of defects in binary and ternary oxides, 12:16329 (R;US)
Mueller Associates, Inc., Baltimore, MD (USA)
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)

N

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Compound cycle engine program, 12:16228 (R;US)
Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)
Effects of graphitization on the environmental stability of brominated pitch-based fibers, 12:16362 (R;US)
Primary arm spacing in chill block melt spun Ni-Mo alloys, 12:16288 (R;US)
Thermal conductivity of pristine and brominated P-100 fibers, 12:16360 (R;US)
National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center
High energy neutrino absorption and its effects on stars in close x-ray binaries, 12:17037 (R;US)
MAX '91: an advanced payload for the exploration of high energy processes on the active sun, 12:17040 (R;US)
NDE reliability and process control for structural ceramics, 12:16333 (R;US)
Neutron and antineutron production in accretion onto compact objects, 12:17042 (R;US)
Two states of CYG X-1 and related sources, 12:17038 (R;US)
National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center
Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)
Investigation of the effects of cobalt ions on epoxy properties, 12:16363 (R;US)
On the Maxwellian distribution, symmetric form, and entropy conservation for the Euler equations, 12:16476 (R;US)
Recent experiences in multidisciplinary analysis and optimization, part 1, 12:16437 (R;US)
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
National Aeronautics and Space Administration, Houston, TX (USA). Lyndon B. Johnson Space Center
Antarctic meteorite newsletter, volume 9, number 1, 12:17029 (R;US)
National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center
Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)

Infrared reflection nebulae in Orion molecular cloud 2, 12:17035 (R;US)
Losses in fountain-effect pumps, 12:16443 (R;US)
National Aeronautics and Space Administration, Washington, DC (USA)
Reports of planetary astronomy, 1985, 12:16969 (R;US)
Upper atmosphere of Venus: a tentative explanation of its rotation, 12:17054 (TJ;US)
National Bureau of Standards, Washington, DC (USA)
Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards, 12:17331 (R;US)
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
National Bureau of Standards, Washington, DC (USA). Synchrotron Ultraviolet Radiation Facility
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)
Exploratory borehole Boettstein: Construction and environmental aspects, drilling techniques, 12:15431 (R;CH;In German)
Exploratory borehole Boettstein: Investigation report. Text volume, 12:15430 (R;CH;In German)
Hydrogeological basis for the modelling area Oberbauenstock, 12:15434 (R;CH;In German)
Long-term stability of bentonite under repository conditions, 12:15433 (R;CH;In German)
Shrinkage experiments on bentonite samples, 12:15432 (R;CH;In German)
Some considerations concerning the thermodynamics and kinetics of the reaction between iron and water in bentonite, 12:16406 (R;CH;In German)
National Geophysical Data Center, Boulder, CO (USA)
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)
Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon, 12:16713 (R;US)
National Materials Advisory Board (NRC), Washington, DC (USA)
Materials for large land-based gas turbines. Final report, 1984-1986, 12:15737 (R;US)
National Oceanic and Atmospheric Administration, Asheville, NC (USA)
Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
National Oceanic and Atmospheric Administration, Boulder, CO (USA)
Solar records: the Wolf sunspot index and umbral/penumbral ratio, 12:16694 (R;US)
National Oceanic and Atmospheric Administration, Silver Spring, MD (USA)
Seasonal tropospheric and stratospheric temperature anomalies for the Northern Hemisphere, 1958-1983, 12:16691 (R;US)
National Research Council, Washington, DC (USA). Committee on Atomic and Molecular Science
Committee on Atomic and Molecular Sciences: Technical progress report for the period February 1, 1986-January 31, 1987, 12:17069 (R;US)
National Research Council, Washington, DC (USA). Uranium Mill Tailings Study Panel
Scientific basis for risk assessment and management of uranium mill tailings, 12:15560 (R;US)
Naval Ocean Research and Development Activity, NSTL, MS (USA)
Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
Nevada Univ., Reno (USA)
Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986, 12:16402 (R;US)
New Hampshire Univ., Durham (USA)
Gamma-ray spectrometer experiment on the solar maximum mission satellite. Final report, 16 October 1984-15 April 1986, 12:17041 (R;US)
New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
New Mexico Univ., Albuquerque (USA). New Mexico Research and Development Inst.
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Niels Bohr Inst., Copenhagen (Denmark)
Chiral order parameter of Wilson fermion formulation in a lattice CP/sup N-1/ model, 12:17181 (R;DK)
Fragmentation of jets produced in hard p anti p collisions at the ISR, 12:17119 (R;DK)
Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)
Correlation functions for the clustering of galaxies and Abell clusters, 12:17045 (R;DK)
Cosmology and galaxy formation. An introduction to some recent ideas, 12:17048 (R;DK)
Early galactic evolution and the nature of the first stars, 12:17049 (R;DK)
Frequency dependent polarization in blazars, 12:17043 (R;DK)
Helioseismology, 12:17046 (R;DK)
Primordial shear and the question of inflation, 12:17047 (R;DK)
Propagator of quantum gravity in minisuperspace, 12:17387 (R;DK)
Solar oscillations, 12:17044 (R;DK)
North Carolina Central Univ., Durham (USA). Dept. of Physics
Plasma diagnostics: Detection of laser scattering: Final report, September 1, 1978 to August 31, 1982, 12:17400 (R;US)
North Carolina State Univ., Raleigh (USA)
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
North Dakota Univ., Grand Forks (USA). Energy Research Center
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Northeastern Univ., Boston, MA (USA). Dept. of Physics
Solving QCD using Monte Carlo Renormalization Group method, 12:17182 (R;US)
Northrop Services, Inc., Research Triangle Park, NC (USA)
Hydroxyl-radical rate-constant intercomparison study. Final report, 12:16718 (R;US)
Northwestern Univ., Evanston, IL (USA). Dept. of Physics
Theoretical studies of defects in binary and ternary oxides, 12:16329 (R;US)
Nuclear Energy Agency, 75 - Paris (France)
Two example applications of optimization techniques to radiation protection programmes of United States Department of Energy Contractors, 12:17333 (BA;XA)
Nuclear Fuel Inst., Zbraslav (Czechoslovakia)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Nuclear Regulatory Commission, Washington, DC (USA)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Release of organic chelating agents from solidified decontamination wastes, 12:15408 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Div. of Accident Evaluation
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Div. of Engineering Safety
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Div. of Reactor Systems Safety
An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)

Nuclear Regulatory Commission, Washington, DC (USA). Div. of Waste Management
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards
Standard format and content of a license application for a low-level radioactive waste disposal facility: Safety analysis report, 12:15435 (R;US)
Standard review plan for the review of a license application for a low-level radioactive waste disposal facility: Safety analysis report, 12:15436 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation
Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425), 12:16060 (R;US)
Technical specifications (Docket No. 50-400): Appendix "A" to License No. NPF-63, 12:15804 (R;US)
Technical specifications, Vogtle Electric Generating Plant, Unit No. 1 (Docket No. 50-424): Appendix "A" to license No. NPF-61, 12:15803 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research
SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
Nuclear Research Inst., Rez (Czechoslovakia)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.)
Transient Tracers in the Oceans (TTO) hydrographic data and carbon dioxide systems, 12:16709 (R;US)
NUS Corp., Gaithersburg, MD (USA)
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Rail transportation corridor analysis report: Deaf Smith County location in the Palo Duro Basin, Texas, 12:15487 (R;US)
NWT Corp., San Jose, CA (USA)
Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report, 12:15771 (R;US)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Electricity and the pulp and paper industry, 12:16218 (R;US)
Historically Black Colleges and Universities Radioactive Waste Management Research Program: Summary of activities, 1985-1986, 12:15424 (R;US)
IEA/ORAU long-term global energy-CO_2 model, 12:16700 (R;US)
Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Nuclear engineering and health physics fellowship, 1985-1986, 12:15924 (R;US)
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Radioactive waste management fellowship, 1985-1986, 12:15423 (R;US)
Roles for electricity in transportation, 12:16209 (R;US)
Roles of electricity: Electric steelmaking, 12:16220 (R;US)
Roles of electricity: Pulp and papermaking, 12:16219 (R;US)
The role of electricity in glass making, 12:16217 (R;US)
Oak Ridge National Lab., TN (USA)
Americium product solidification and disposal, 12:15441 (R;US)
An experiment in combining estimates of uncertainty, 12:16913 (R;US)
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)
Assessment of ceramic composites for multimegawatt space nuclear power systems, 12:15867 (R;US)
Cleanup operations at the Oak Ridge Gaseous Diffusion Plant contaminated metal scrapyard, 12:15415 (R;US)
Confidence in technologies: Interactions between publics and industries, 12:16912 (R;US)
Consolidated Fuel Reprocessing Program: Progress report for period July 1 to September 30, 1986, 12:15389 (R;US)
Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models, 12:17192 (R;US)
3-D world modeling with updating capability based on combinatorial geometry, 12:16440 (R;US)
Determining the extent, benefits, cost, and timing of utility conservation and load management programs, 12:16173 (R;US)
Drop tests of the Three Mile Island knockout canister, 12:15800 (R;US)
Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
Effect of aluminum addition on ductility and yield strength of Fe_3Al alloys with 0.5 wt % TiB_2, 12:16258 (R;US)
Energy division: Annual progress report for period ending September 30, 1982, 12:16154 (R;US)
Evaluating telerobotics for battlefield support operations, 12:16441 (R;US)
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Excitations in small spherical particles, 12:17358 (R;US;In Spanish)
Flaw density examinations of a clad boiling water reactor pressure vessel segment, 12:15763 (R;US)
How to set up a successful production graphics facility, 12:17642 (R;US)
How well does ORIGEN predict spent LWR [Light Water Reactor] fuel characteristics, 12:15416 (R;US)
Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17486 (R;US)
Maintenance features of the Compact Ignition Tokamak fusion reactor, 12:17432 (R;US)
Major world ecosystem complexes ranked by carbon in live vegetation: a database, 12:16710 (R;US)
Medical isotopes at Oak Ridge National Laboratory, 12:16811 (R;US)
Nuclear medicine: Progress report for quarter ending September 30, 1986, 12:16813 (R;US)
Nuclear Safety: Technical progress review, January-March 1987, 12:16063 (R;US)
Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)
On the use of CORLIB subroutines for the solution of a model fluid flow problem, 12:17655 (R;US)
ORNL trends and balances, 1987-1992, 12:16160 (R;US)
PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)
Photon emission from irradiated solids: Proceedings of the Werner Brandt workshop on penetration phenomena, 12:17338 (R;US)
Quality assurance consideration for cement-based grout technology programs at Oak Ridge National Laboratory, 12:15414 (R;US)
Radioqensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth, 12:16773 (R;US)
Recovery of methane from combined industrial and municipal wastewater by anaerobic treatment, 12:15586 (R;US)
Representational issues in machine learning, 12:17641 (R;US)
Resource management plan for the Oak Ridge Reservation: Volume 24, Threatened and endangered animal species, 12:16782 (R;US)
Sensitivity analysis of ORION, 12:15362 (R;US)
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
Stable isotope customer list and summary of shipments, FY 1986, 12:16408 (R;US)

The effects of heavy doping on the electronic states in semiconductors, 12:17340 (R;US)
The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
The "ring killer" experiment: Electron confinement in the ELMO Bumpy Torus without the influence of hot-electron rings, 12:17415 (R;US)
Tree ring chronology indexes and reconstructions of precipitation in Central Iowa, USA, 12:16689 (R;US)
Upgrade of the GRESS (test version D) precompiler to allow triply-dimensioned arrays, 12:17654 (R;US)
Viscosity behavior in supercooled pure liquids and mixtures, 12:16407 (R;US)

Oesterreichische Akademie der Wissenschaften, Vienna
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)

Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.
Non-contacting thickness-gauging of fine steel plates, 12:15580 (R;AT;In German)

Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering
Phase behavior of coal fluids: Data for correlation development: Report for the period August 1, 1986 to October 31, 1986, 12:15301 (R;US)

Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science
Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986, 12:15304 (R;US)

Old Dominion Univ., Norfolk, VA (USA)
Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)

Old Dominion Univ., Norfolk, VA (USA). Research Foundation
Continental shelf processes affecting the oceanography of the South Atlantic Bight: Progress report, June 1, 1986 to May 31, 1987, 12:16933 (R;US)

Ontario Hydro, Toronto (Canada)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)

Ontario Hydro, Toronto (Canada). Research Div.
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)

Oregon Univ., Eugene (USA). Inst. of Theoretical Physics
Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)

P

Pacific Northwest Lab., Richland, WA (USA)
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement, 12:15610 (R;US)
Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine, 12:15447 (R;US)
Evaluation and status report on HYDROCOIN at midway (HYDROCOIN: An international project for studying groundwater hydrology modelling strategies), 12:16920 (R;US)
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Hanford defense mission: Past, present and future, 12:17631 (R;US)
Hanford 67-series: atmospheric field-diffusion measurements, micrometeorological and tracer data archive, Set 003 documentation report. Interim report, 12:16719 (R;US)
Managing the data analysis process, 12:17656 (R;US)
Nuclear Waste Treatment Program: Qualification of commercial high-level waste forms: Approach and status, 12:15445 (R;US)
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

Pacific Nuclear Services, Richland, WA (USA)
Postaccident chemical decontamination: Method development: Final report, 12:16030 (R;US)

Paderborn Univ. (Gesamthochschule) (Germany, F.R.). Abt. fuer Naturwissenschaften 2
Investigation of extraction of a model mixture similar to coal oil with supercritical gases, 12:15289 (R;DE;In German)

Paderborn Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich 13 - Chemie und Chemietechnik
Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas, 12:16405 (R;DE;In German)

Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire
Connection of two-particle relativistic quantum mechanics with the Bethe-Salpeter equation, 12:17142 (R;FR)
MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)

Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire
High field electron linacs, 12:16529 (R;FR)

PEDCo-Environmental, Inc., Cincinnati, OH (USA)
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)

PEI Associates, Inc., Cincinnati, OH (USA)
Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory, 12:16716 (R;US)

Pennsylvania State Univ., University Park (USA). Davey Lab.
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)

Pennsylvania Univ., Philadelphia (USA)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)

Physical Sciences, Inc., Andover, MA (USA)
Transformations of inorganic coal constituents in combustion systems: Quarterly report No. 1 for the period October-December 1986, 12:15328 (R;US)

Physical Sciences, Inc., Woburn, MA (USA)
Interaction of trace species with the molten carbonate fuel cell: Task report No. 12, 12:16193 (R;US)

Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Gruppe Strahlenschutzmetrologie
New dose quantities for personnel dosemeters. Results of the intercomparison program 1985 - seminar report, 12:16649 (R;DE;In German)

Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986, 12:15324 (R;US)

Pittsburgh Univ., PA (USA). Inst. for Computational Mathematics and Applications
Toward efficient implementations of PCCG (preconditioned conjugate gradient) methods on vector supercomputers. Technical report, 12:17639 (R;US)
Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)
Breached pin performance in the EBR-II RBCB program, 12:15977 (R;US)
Thermal impact of $Na_3(U/sub\ 1\text{-}y/Pu/sub\ y/)O_4$ formation on a breached LMR fuel element, 12:15980 (R;US)
Pratt and Whitney Aircraft, East Hartford, CT (USA)
Thermal barrier coating life prediction model development. Annual report, 12:16332 (R;US)
Princeton Univ., NJ (USA). Plasma Physics Lab.
Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines, 12:15760 (R;US)
Purdue Univ., Lafayette, IN (USA). Dept. of Physics
The fifth force, 12:17126 (R;US)

Q

Queens Coll., New York (USA). Dept. of Physics
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)

R

Radian Corp., Durham, NC (USA)
Locating and estimating air emissions from sources of ethylene oxide, 12:16724 (R;US)
REECo, Las Vegas, NV (USA)
SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)
Rennes-1 Univ., 35 (France)
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)
Research Triangle Inst., Durham, NC (USA)
Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)
Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)
Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
Rheinisch-Westfaelisches Inst. fuer Wirtschaftsforschung, Essen (Germany, F.R.)
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Rice Univ., Houston, TX (USA)
An overview of low-energy ion-atom collisions, 12:17067 (R;US)
Risoe National Lab., Roskilde (Denmark)
Electron cyclotron resonance heating of a high-density plasma, 12:17416 (R;DK)
Rochester Univ., NY (USA). Dept. of Mechanical Engineering
Chemical potential in a stressed solid, 12:17341 (R;US)
Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Inertia friction welding of 1100 aluminum to type 316 stainless steel, 12:16295 (R;US)
Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
Effects of gamma radiolysis on waste package components, 12:16263 (R;US)

S

Sandia National Labs., Albuquerque, NM (USA)
A modeling study of the Culebra dolomite, 12:16921 (R;US)
A numerical signal processing technique for borehole seismic fracture diagnostics, 12:15367 (R;US)
An experimental study of isothermal and boiling liquid jets, 12:16062 (R;US)
An integral model of plume rise from high explosive detonations, 12:16679 (R;US)
Cask technology program activities, 12:16446 (R;US)
Evaluation of international photovoltaic projects: Volume 1, Executive summary, 12:15616 (R;US)
Graphics NC generation in a prototype machining laboratory: CAM report, 12:16445 (R;US)
Intense lithium ion beam diagnostic using the inverse nuclear reactor $D(^7Li,n)^8Be$, 12:17487 (R;US)
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
Magma energy extraction, 12:15630 (R;US)
Nuclear reactor excitation of XeF laser gas mixtures, 12:16467 (R;US)
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)
Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
Progress in photovoltaic concentrator research, 12:15611 (R;US)
PVFORM Version 3.2: a PV simulation program for mini and micro computer systems. Second version, 12:15617 (R;US)
Residual effects in laminated, curved, composite panels, 12:16236 (R;US)
Silicon solar cells with polysilicon contacts, 12:15612 (R;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)
Waste glass leaching: Chemistry and kinetics, 12:15448 (R;US)
Sandia National Labs., Livermore, CA (USA)
10 MWe Solar Thermal Central Receiver Pilot Plant control system description, 12:15620 (R;US)
Saratoga Engineering Consultants, Inc., San Jose, CA (USA)
EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software, 12:15976 (R;US)
Schlumberger-Doll Research Center, Ridgefield, CT (USA)
Spin-waves in the uniaxial spin-glass system $Fe/sub\ 1\text{-}x/Mg/sub\ x/Cl_2$, 12:17337 (R;US)
Schweizerisches Inst. fuer Nuklearforschung, Villigen
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
Science Applications International Corp., McLean, VA (USA)
Methanol production from indigenous resources in New York State, 12:15591 (R;US)
Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants, 12:15593 (R;US)
Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants, 12:15594 (R;US)
Methanol production from indigenous resources in New York State. Volume 1. Executive summary, 12:15592 (R;US)
S-Cubed, La Jolla, CA (USA)
Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)
SERA Solar Corp., Santa Clara, CA (USA)
Silicon solar cells with polysilicon contacts, 12:15612 (R;US)
Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav
4th international symposium on neutron induced reactions. The abstracts of contributed papers, 12:17264 (R;CS)
Smithsonian Astrophysical Observatory, Cambridge, MA (USA)
Space infrared telescope facility wide field and diffraction limited array camera (IRAC). Semiannual status report, 1 March-31 August 1986, 12:16673 (R;US)
Variability studies of 3C 371. Final report, 1 April 1985-30 September 1986, 12:16968 (R;US)
Solar Energy Research Inst., Golden, CO (USA)
Microalgae culture collection, 1986-1987, 12:15613 (R;US)
Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986, 12:15614 (R;US)
The SERI Resource Assessment Project's plan for collecting spectral-solar-irradiance data, 12:15597 (R;US)

South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy
Participation in the ARGUS experiment at the DORIS Collider at Desy, Hamburg, Germany and participation in the AMY experiment at the TRISTAN Collider in Tsukuba, Japan: 1986 progress report, 12:17099 (R;US)
SRI International, Menlo Park, CA (USA)
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Stanford Linear Accelerator Center, Menlo Park, CA (USA)
Heavy flavors, 12:17155 (R;US)
Properties of the EM cascade: A tutorial utilizing high resolution 3D color graphics, 12:17325 (R;US)
Unique radiation problems associated with the SLAC Linear Collider, 12:16516 (R;US)
Stanford Univ., CA (USA)
Simulations of turbulent mixing and reacting flows and their applications to turbulence modeling. Semiannual progress report, 12:16433 (R;US)
State Electricity Commission of Victoria, Melbourne (Australia)
Characterisation of insoluble residues from the hydrogenation of Victorian brown coals, 12:15307 (R;AU)
Statens Raad foer Byggnadsforskning, Stockholm (Sweden)
Development of advanced water-to-water heat pumps in the range of 200- to 5000-kW thermal output: prestudy, 12:16206 (R;US)
Simulation of heat losses and ground temperatures for district-heating culverts. Comparison with field experiments for well-insulated, damaged, and extra-insulated culverts, 12:16227 (R;US)
State Univ. of New York, Albany (USA)
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
State Univ. of New York, Buffalo (USA). Dept. of Chemistry
Heat capacities of rare gases adsorbed on graphite. Technical report, 12:16345 (R;US)
State Univ. of New York, Stony Brook (USA)
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)
Stevens Inst. of Tech., Hoboken, NJ (USA). Dept. of Materials and Metallurgical Engineering
Spin polarized photoelectron studies of magnetism in solids: Progress report for period June 1, 1986-May 31, 1987, 12:16265 (R;US)
Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Research on and applications of non-linear costs functions in the Dutch energy models SELPE and DELPE, 12:16152 (R;NL;DU)
Stoller (S.M.) Corp., Boulder, CO (USA)
Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)
Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires
Coulomb displacement energies between analog levels for 44 < = A < = 239, 12:17218 (R;FR)
Streak camera and picosecond metrology of laser impulses running at high repetitive rates, 12:16602 (R;FR;In French)
Stuttgart Univ. (Germany, F.R.)
Study including experiments on the diffusion emissions caused by accidents, 12:16711 (R;DE;In German)
Synergic Resources Corp., Seattle, WA (USA)
Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)
Synergy Applied Research Ltd., Wellington (New Zealand)
In-situ performance of solar water heaters: a testing programme. Final report, 12:15623 (R;US)
Syracuse Univ., NY (USA)
Grain boundary oxidation and fatigue crack growth at elevated temperatures. Final report, 12:16287 (R;US)

T

Tarapur Atomic Power Station (India)
Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen
Energy optimisation of industrial furnaces by optimum control, 12:16500 (R;DE;In German)
Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet
Heavy flavour decays and the structure of weak interactions, 12:17132 (R;DE)
Technische Univ. Berlin (Germany, F.R.). Fachbereich Verfahrenstechnik
Water removal characteristics of fine coal particles, 12:15268 (R;DE;In German)
Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik
Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers, 12:16477 (R;DE;In German)
Selection of working fluids for absorption heat pumps, 12:16204 (R;DE;In German)
Technische Univ. Hamburg-Harburg (Germany, F.R.). Promotionsausschuss
Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae, 12:15590 (R;DE;In German)
Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet fuer Physik
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
Technische Univ. Muenchen, Garching (Germany, F.R.). Inst. fuer Radiochemie
Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
Technische Univ. Muenchen, Garching (Germany, F.R.). Physikdepartment
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
Technology International, Inc., Laplace, LA (USA)
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)
Tennessee Univ., Knoxville (USA)
High-spin states and coexisting states in the Pt-Au transition region, 12:17235 (R;US)
Tennessee Univ., Knoxville (USA). Dept. of Physics
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
The effects of heavy doping on the electronic states in semiconductors, 12:17340 (R;US)
Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky
Automated beta spectrometer, 12:16628 (R;CS;In Czech)
Texaco, Inc., South El Monte, CA (USA). Montebello Research Lab.
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Texas Univ., Austin (USA). Inst. for Fusion Studies
Simulation of ion cyclotron resonance heating through resonant absorption in two-ion species plasma, 12:17401 (R;US)
Tokyo Gas Research and Development Inst. (Japan)
Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body, 12:16883 (TG;GB)
Tokyo Univ. (Japan). Inst. for Solid State Physics
Spin-waves in the uniaxial spin-glass system Fe/sub 1-x/Mg/sub x/Cl_2, 12:17337 (R;US)
Tokyo Univ. (Japan). Research Center for Nuclear Science and Technology
Report of the symposium on 'total research on long life radioactive waste management' in the Research Center for

Nuclear Science and Technology, Univ. of Tokyo, 12:15452 (R;JP;In Japanese)
Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research
Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)
Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study
Data compilation of single pion photoproduction below 2 GeV, 12:17112 (R;JP)
Data compilation of single pion photoproduction below 2 GeV, 12:17113 (R;JP)
Isoscalar quadratic energy weighted sum rules and quadrupole moment of giant quadrupole resonance, 12:17285 (R;JP)
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)
Monte Carlo study of anisotropic Heisenberg chain with spin 1, 12:17347 (R;JP)
Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.
Proceedings of study meeting on nuclear fission-nuclear fusion hybrid reactors, 12:17490 (R;JP;In Japanese)
TRIUMF, Vancouver, British Columbia (Canada)
Review of results from TRIUMF, 12:17120 (R;CA)
SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
The TRIUMF kaon factory proposal, 12:16569 (R;CA)
TRW Space and Technology Group, Redondo Beach, CA (USA)
Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985, 12:15282 (R;US)
TRW Space and Technology Group, Redondo Beach, CA (USA). Energy Div.
Development of a microwave coal cleaning process: Technical progress report for March 1985-May 1985, 12:15283 (R;US)
Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)
Calculation and modelling of electron channel with a beam small angular divergence, 12:16544 (R;SU;In Russian)
Calculation of strain-stressed state of the tyre system of superconducting dipole magnets, 12:16568 (R;SU;In Russian)
Calibration of thermonuclear neutron detectors, 12:17414 (R;SU;In Russian)
Characteristics of the Erevan synchrotron extracted electron e/ sup -//sub 4/beam, 12:16548 (R;SU;In Russian)
Data acquisition and storage system for the e-A experimental setup on the basis of the Ehlektronika-60 microcomputer, 12:16546 (R;SU;In Russian)
Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons, 12:17344 (R;SU;In Russian)
EhLEKTRON magnetic spectrometer calibration, 12:16605 (R;SU;In Russian)
Erevan accelerator with a beam small angular divergence, 12:16545 (R;SU;In Russian)
Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron, 12:16547 (R;SU;In Russian)
Experimental study of two-beam resonator accelerator in a pulse mode, 12:16515 (R;SU;In Russian)
Gravitation and vacuum field, 12:17359 (R;SU;In Russian)
High-voltage cable lead-in for pulse techniques, 12:17485 (R;SU;In Russian)
Identification of electrons by means of a scintillation telescope at Esub(e) = 1-3 GeV, 12:16606 (R;SU;In Russian)
Measurement of the polarization of cumulative protons in γA -> pX reaction, 12:17101 (R;SU)
Monte-Carlo simulation of electromagnetic showers, 12:16603 (R;SU;In Russian)
Non-linear stage of beam instability in the absence of electron capture by a wave field, 12:17410 (R;SU;In Russian)
Nuclear-optical methods for production of polarized photons with energies of a few hundred GeV, 12:17306 (R;SU)
On the growth of hadronic photoabsorption cross-section, 12:17102 (R;SU)
On the possibility of using a neutron supermonitor in the ANI complex experiment, 12:16604 (R;SU;In Russian)
Phase velocity of wave in irregular waveguide in problems of synthesis, 12:16523 (R;SU)
Reliability of high-voltage electron accelerators, 12:16514 (R;SU;In Russian)
Space-angular distribution of Synchrotron radiation power in electron storage rings with account of betatron oscillations, 12:16592 (R;SU;In Russian)
Suppression of multiple scattering at planar channeling of negative particles, 12:17070 (R;SU)
Technique and preliminary results for in-reactor investigation of corrosion and mechanical behaviour of zirconium alloys under non-isothermal conditions, 12:16292 (R;SU;In Russian)
TOREX program for calculating aberration coefficients of magnetooptical systems, 12:16530 (R;SU;In Russian)
Tsukuba Univ., Sakura, Ibaraki (Japan)
Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)
Tufts Univ., Medford, MA (USA)
Simultaneous solar maximum mission (SMM) and very large array observations of solar active regions. Annual report, 1 September 1985-30 October 1986, 12:17033 (R;US)
Turin Univ. (Italy)
Nucleon decay experiments: status and prospects, 12:17094 (R;US)

U

UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.
Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)
UKAEA Risley Nuclear Power Development Labs.
Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack, 12:16291 (R;GB)
Ulster Univ., Coleraine (UK). Dept. of Physics
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
United Technologies Corp., East Hartford, CT (USA)
Mechanical properties of various alloys in hydrogen. Final report, 12:16289 (R;US)
United Technologies Research Center, East Hartford, CT (USA)
User's manual for a TEACH computer program for the analysis of turbulent, swirling reacting flow in a research combustor, 12:16499 (R;US)
Universidad Catolica de Chile, Santiago
Excitations in small spherical particles, 12:17358 (R;US;In Spanish)
Universidad Tecnica Federico Santa Maria, Valparaiso (Chile)
Excitations in small spherical particles, 12:17358 (R;US;In Spanish)
University of Southern California, Los Angeles (USA)
Fluidization mechanisms in slurry flows: Quarterly report, 12:16474 (R;US)
USDOE Albuquerque Operations Office, NM. Uranium Mill Tailings Remedial Action Project Office
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 1, Text, 12:15561 (R;US)
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 2, Appendices, 12:15562 (R;US)
USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of International Security Affairs
Sensitive nuclear activities in certain free world countries, 12:16162 (R;US)
USDOE Assistant Secretary for Fossil Energy, Washington, DC
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:16168 (R;US)
USDOE Assistant Secretary for Management and Administration, Washington, DC. Agency Competition Advocate
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)

USDOE Assistant Secretary for Management and Administration, Washington, DC. Directorate of Procurement and Assistance Management
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)
USDOE Bartlesville Project Office, OK
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels
Electric power monthly, October 1986, 12:16172 (R;US)
USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use
Performance profiles of major energy producers, 1985, 12:16155 (R;US)
USDOE Morgantown Energy Technology Center, WV
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
USDOE Nevada Operations Office, Las Vegas
Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)
USDOE, Washington, DC
LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis, 12:15565 (R;US)
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)
Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)
Advances in sodium technology, testing and diagnostics of fast reactors, 12:15856 (R;CS;In Czech and Russian)
Utah Geological and Mineral Survey, Salt Lake City (USA)
Low-temperature geothermal assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah, 12:15625 (R;US)
Utah State Univ., Logan (USA). Utah Water Research Lab.
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)
Utah Univ., Salt Lake City (USA)
Magma energy extraction, 12:15630 (R;US)
Utah Univ., Salt Lake City (USA). Dept. of Physics
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)

V

Vanderbilt Univ., Nashville, TN (USA)
Theoretical investigations in elementary particle physics: Progress report, June 1, 1986-May 31, 1987, 12:17161 (R;US)
Vanderbilt Univ., Nashville, TN (USA). School of Medicine
Studies of aluminum in rat brain, 12:16884 (R;US)
Veterans Administration Medical Center, East Orange, NJ (USA)
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Management Systems Labs.
Fundamental research of decision support systems: Final report, 12:15563 (R;US)
Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Abt. Forschung und Entwicklung
Aldehyde toxicity and load of immissions from motor vehicles, 12:16905 (R;DE;In German)
Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (USSR)
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Vsesoyuznyj Nauchno-Issledovatel'skij Teplotekhnicheskij Inst., Moscow (USSR)
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)

W

Washington Univ., Seattle (USA)
Atomic physics 9, 12:17085 (B;SG)
Washington Univ., Seattle (USA). Dept. of Physics
The fifth force, 12:17126 (R;US)
Washington Univ., Seattle (USA). Nuclear Physics Lab.
A 300 kV isolation platform at the University of Washington, 12:16543 (R;US)
Beam dynamics calculations for the linac booster beam line, 12:16522 (R;US)
Washington Univ., St. Louis, MO (USA)
Damage assessment in composites by acoustic-ultrasonic technique. Final report, September 1985-August 1986, 12:16346 (R;US)
Weber State Coll., Ogden, UT (USA). Dept. of Physics
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Nonlinear RR Lyrae models with time dependent convection, 12:16964 (R;US)
Werner (F.) Industrie-Ausruestungen G.m.b.H., Geisenheim (Germany, F.R.). Abt. Neue Technologie - Energie
Biomass partial gasification. Final report, 12:15584 (R;DE;In German)
Western Kentucky Univ., Bowling Green (USA)
Establishment of data bank on the self-heating of coal. Final report, 12:15325 (R;US)
Western Michigan Univ., Kalamazoo (USA). Dept. of Physics
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
Western Research Inst., Laramie, WY (USA)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Westinghouse Electric Corp., Carlsbad, NM (USA). Technology Development Dept.
1986 annual water quality data report for the Waste Isolation Pilot Plant, 12:15488 (R;US)
Westinghouse Electric Corp., Cheswick, PA (USA). Electromagnetic Div.
The development of a cavitation free sodium pump for the breeder reactor, 12:15851 (R;US)
Westinghouse Electric Corp., Orlando, FL (USA)
Corrosion-resistant coatings for low-pressure steam turbines: Final report, 12:15736 (R;US)
Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Systems Technology Div.
Simulation of geomagnetic currents induced in a power system by magnetohydrodynamic electromagnetic pulses, 12:15666 (R;US)
Westinghouse Electric Corp., Pittsburgh, PA (USA). Chemical Sciences Div.
Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)
Westinghouse Research and Development Center, Pittsburgh, PA (USA)
The development of a cavitation free sodium pump for the breeder reactor, 12:15851 (R;US)
West Virginia Univ., Morgantown (USA)
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
Wisconsin Univ., Madison (USA)
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)

Wissenschaftszentrum Berlin (Germany, F.R.). Internationales Inst. fuer Umwelt und Gesellschaft
Consumer energy conservation policies and programmes in Britain, 12:16166 (R;DE)

Woodward-Clyde Consultants, Pasadena, CA (USA)
Inversion for source parameters of underground nuclear explosions with implications for yield estimation. Technical report, 5 September 1985-5 March 1986, 12:16681 (R;US)

PERSONAL AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German; are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes. For publications with multiple authors, an entry is provided for each author. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

A

Aaron, W.S., *See* Box, W.D., 12:15800

Abdalla, E., Chiral order parameter of Wilson fermion formulation in a lattice CP/sup N-1/ model, 12:17181 (R;DK)

Abdalla, M.C.B., *See* Abdalla, E., 12:17181

Abdelhai, M., Quantile arithmetic methodology for uncertainty propagation in fault trees, 12:16111 (J;US)

Abdou, M., Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
See Majid, A., 12:17578

Abdou, M.A., *See* Garner, J.K., 12:17519
See Gierszewski, P.J., 12:17531
See Hollenberg, G.W., 12:17628
See Nakagawa, M., 12:17532
See Nakamura, T., 12:17508
See Tillack, M.S., 12:17530

Abe, Y., *See* Delagrange, H., 12:17260

Abraham, M.M., Electrolytic coloration and electrical breakdown of MgO single crystals, 12:16343 (J;US)

Abraham, S.G., A communication model for optimizing hierarchical multiprocessor systems, 12:17667 (BA;US)

Abramov, B.D., On the method of separation of regions in the framework of the neutron transport theory, 12:17310 (R;SU;In Russian)

Abrams, C.S., *See* Huebner, M.F., 12:15860

Abrosimov, V.N., Time planar HPGe detectors, 12:16632 (R;SU;In Russian)

Abu-Sufah, W., Vector processing on the Alliant FX/8 multiprocessor, 12:17663 (BA;US)

Ache, H.J., *See* Zaghloul, R., 12:16391

Ackerman, E.B., Mutants of Escherichia coli affected in inducer exclusion, 12:16825 (RA;US)

Ackerman, J.L., Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials, 12:16327 (R;US)

Ackerman, J.P., Materials for high-temperature fuel cells, 12:16197 (BA;US)

Acock, B., *See* Reynolds, J.F., 12:16764

Ad'yasevich, B.P., *See* Bem, P., 12:17278

Adam, I., Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)

Adams, D., In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)

Adams, J.P., Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)

Adams, J.W., *See* Piciulo, P.L., 12:15408

Adams, R.C., *See* Kennedy, W.E. Jr., 12:15443

Adamyan, F.V., *See* Agababyan, K.Sh., 12:16547

Addis, R.P., *See* Weber, A.H., 12:16769

Ado, Yu.M., High-intensity proton beam formed onto internal target of the IHEP accelerator, 12:16553 (R;SU;In Russian)

Adolf, A., *See* Louis-Jacquet, M., 12:16463

Agababyan, K.Sh., Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron, 12:16547 (R;SU;In Russian)

Agagu, A., *See* Johnson, B.M., 12:17058

Agaronyan, A.V., *See* Avakyan, R.O., 12:16545

Agaronyan, F.A., Ultra-high energy gamma-rays as the carriers of cosmological information, 12:16942 (R;SU)

Agarwal, K.L., *See* Gurol, H., 12:17607

Aguer, P., *See* Bimbot, R., 12:16559

Aguilar, O., Measurement of reactivity temperature coefficient by noise method in a power reactor, 12:15802 (R;HU)

Ahearn, M.F., International Halley Watch: discipline specialists for photometry and polarimetry, 12:17024 (RA;US)
Observations of comets and asteroids, 12:16994 (RA;US)
See Mcfadden, L.A., 12:17010

Ahluwalia, R.K., The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)

Ahmed, G., Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)

Aiken, R.H., *See* Willis, J.O., 12:16285

Ainardi, A., *See* Praca, C., 12:15409

Aitken, E.A., Application of systems engineering to fuel processing activities, 12:15911 (J;US)

Ajrapetyan, A.V., *See* Agababyan, K.Sh., 12:16547

Akers, D.W., TMI-2 lower vessel debris examinations, 12:16024 (R;US)

Akhundov, A.A., Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering, 12:17152 (R;SU;In Russian)

Akopov, N.Z., Design principle and structure of the ANI data centre, 12:16609 (R;SU)

Akopova, A.B., Sandwich nuclear emulsion emitter-detector-emitter systems with regulated sensitivity, 12:16607 (R;SU;In Russian)

Akopyan, V.P., Quadrupole lense field potential determination by the boundary integral eguation method, 12:16527 (R;SU;In Russian)

Aksan, S.N., BWR/6 DBA analysis with limited ECC, 12:16090 (J;US)

Al'bertinskij, B.I., Reliability of high-voltage electron accelerators, 12:16514 (R;SU;In Russian)

Al-Janabi, T., Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy, 12:17231 (RA;CS)

Alaconis, W.C., *See* Hinckley, J.P., 12:15393

Alammar, M.A., Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)

Alanakyan, R.A., On the question of Higgs boson production in heavy quarkonium decays, 12:17129 (R;SU)

Alard, J.P., Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)

Alarja, J., *See* Pollacco, E.C., 12:17227

Alberti, M., *See* Zhu, Y.S., 12:16796

Albertini, R.J., Human lymphocyte mutagenicity assay, 12:16898 (RA;US)

Albrechtova, M., *See* Pesek, M., 12:16851

Albright, C.E., *See* Arnot, R.S., 12:16321

Aleev, A.N., A-dependence of production cross section of the Nsub(PHI) narrow baryon resonance, 12:17118 (R;SU;In Russian)

Aleksakhin, Yu.I., Relativistic theory of forming space charge laminar flows, 12:17178 (R;SU;In Russian)

Alekseevskij, D.V., Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17366 (R;SU;In Russian)
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17367 (R;SU;In Russian)

Alemberti, A., *See* Hu, M.H., 12:15834

Alexander, J., Prototype results of a high resolution vertex drift chamber for the Mark II SLC upgrade detector, 12:16659 (J;NL)
Alexander, P. Jr., Environmental tests of metallization systems for terrestrial photovoltaic cells, 12:15603 (R;US)
Alexandre, D., Low and medium level liquid waste processing at the new La Hague reprocessing plant, 12:15411 (R;FR;In French)
Alferov, V.N., Setup for studying targets irradiated by high density proton beam, 12:16554 (R;SU;In Russian)
Alford, W.J., *See* Rice, J.K., 12:16467
Alikov, B.A., *See* Adam, I., 12:17232
Allamandola, L.J., Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)
Allan, C.R., *See* Titzler, P.A., 12:16458
Allen, C.C., Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)
Allen, G.C. Jr., Cask technology program activities, 12:16446 (R;US)
Allen, G.M., Windfarm noise issues and impacts, 12:15642 (BA;US)
Allen, J.K., Health physics or industrial hygiene, 12:15535 (RA;US)
Allen, M.D., *See* Hoover, M.D., 12:17552
Allen, W.R., *See* Chu, W.K., 12:16366
Alliot, P., Seismic behavior of spent-fuel racks supported by aseismic bearing devices, 12:15403 (J;US)
Allison, L.J., *See* Olson, J.S., 12:16710
Allison, P., *See* Smith, H.V. Jr., 12:16564
Allmon, W.E., Chemical analysis for fossil plant water chemistry, 12:15726 (RA;US)
Alvarez, O., String theory and holomorphic line bundles, 12:17180 (R;US)
Alvin, M.A., *See* Bachovchin, D.M., 12:15276
Amatuni, Ts.A., Monte-Carlo simulation of electromagnetic showers, 12:16603 (R;SU;In Russian)
Ambrose, K.R., *See* Knapp, F.F. Jr., 12:16813
Amer, N.M., Spatially-resolved non-contact methods for the investigation of transport and defects in semiconductors, 12:16398 (BA;US)
Amick, R., *See* Karaffa, M., 12:16716
Amner, J.R., *See* Brummert, A.C., 12:15360
Ammosov, V.V., Study on the inclusive neutrino (antineutrino) interactions with nuclei at 3-30 GeV, 12:17105 (R;SU;In Russian)
Amoruso, G.V., Factors affecting boiler water chemistry, 12:15712 (RA;US)
Amos, N., Drift-pots for small angle elastic scattering at the Fermilab collider, 12:16657 (J;NL)
An, Z.G., Energy confinement in a high-current reversed field pinch, 12:17483 (RA;US)
Analytis, G.T., Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
See Aksan, S.N., 12:16090
Anand, R.P., Progress report on nuclear data activities in India for the period from July 1984 to December 1985, 12:17191 (R;IN)
Anantatmula, R.P., *See* Lutton, J.M., 12:15852
Ancona, D.F., Wind energy technology research in the U.S., 12:15660 (BA;US)
Andersen, J.G.M., *See* Chu, K.H., 12:16138
Andersen, W.J., *See* Niitenberg, A., 12:15840
Anderson, C.K., Optimization of spent-fuel storage equipment with extended burnup, 12:15781 (J;US)
Anderson, G.L., Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
Anderson, J.L., Tritium technology studies at the Tritium Systems Test Assembly, 12:17544 (J;US)
Anderson, M.J., *See* Jones, D.B., 12:15775, 12:15777
Anderson, M.S., User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
Anderson, R.B., Battery-powered vehicle research in South Africa, 12:16233 (R;ZA)
Anderson, T.D., Energy R & D - A national opportunity, 12:16167 (BA;US)
Anderson, T.J., *See* Eckbreth, A.C., 12:16434
Ando, M., PF experimental hall and some selected current topics in SR experiments, 12:16572 (RA;US)
Andre, M., PHEBUS: a new powerful laser facility for ICF research, 12:17430 (R;FR)
Andreeva-Andrievskaya, L.N., *See* Solyany, V.I., 12:16021
Andrews, L.J., *See* Lempicki, A., 12:16472
Andrews, L.M., Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)
Andrews, T.K., *See* Fisher, D.R., 12:16871
Andrianov, A.A., Chiral anomalies and finite-mode regularization of the fermion integral, 12:17168 (R;SU;In Russian)
Andriashin, A.V., Memory division module MDP.2, 12:16671 (R;SU;In Russian)
Angell, J.F., Seasonal tropospheric and stratospheric temperature anomalies for the Northern Hemisphere, 1958-1983, 12:16691 (R;US)
Anghaie, S., *See* Greek, K., 12:15790
See Kaya, S., 12:15784
See Samuels, J.N., 12:15794
Anglesey, M.O., Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)
Angus, I.G., *See* Gottschalk, T.D., 12:16682
Anne, R., *See* Bimbot, R., 12:16559
Anriashin, A.V., Time of flight spectrometer for the measurement of gamma correlated neutron spectra, 12:16627 (RA;CS)
Ansart, J.P., *See* Dormeval, R., 12:16243
Anspaugh, B.E., Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
Antalik, R., Gamma-ray competition in continuum, 12:17265 (RA;CS)
Antoine, A.C., Catalyst and electrode research for phosphoric acid fuel cells, 12:16195 (BA;US)
Antonenko, V.G., *See* Bem, P., 12:17278
Antoniades, J., Observation of Doppler shifts and applied magnetic disturbances in PS-3.5, 12:17457 (RA;US)
Antony, M.S., Coulomb displacement energies between analog levels for 44 < = A < = 239, 12:17218 (R;FR)
Apostolidis, C., *See* Kim, J.I., 12:16429
Appleton, B.R., Surface modification of solids, 12:16317 (BA;US)
See Farlow, G.C., 12:16341
See Poker, D.B., 12:16316
Arakawa, E.T., *See* Tsang, K.L., 12:16293, 12:17353
Arbuzov, B.A., Approach to calculation of the infrared region contribution to vacuum expectation values of gluonic and quark fields, 12:17163 (R;SU)
Ardouin, D., Search for impact parameter dependence of two-particle correlations using exclusive observables in nucleus-nucleus collisions at intermediate energies, 12:17219 (R;FR)
See Kyanowski, A., 12:17236
Aref'ev, A.S., Inclusive cross sections of π/sup +/, p, /sup 2/H, /sup 3/H, / sup 3/He yields at angle 3.5 deg in 6.37 and 8.08 GeV/c proton interactions with Be, Al, Cu, Ta nuclei, 12:17197 (R;SU;In Russian)
Aref'ev, V.A., *See* Aleev, A.N., 12:17118
Arkhipov, V.V., Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)
Armani, R.J., *See* Knox, A.E., 12:16542
Armor, A.F., *See* Graham, L.J., 12:15698
See Imam, I., 12:15695
See Mannava, S.R., 12:15705
See Scheibel, J.R., 12:15681
Armstrong, G.A., *See* Zhu, Y.S., 12:16796
Armstrong, W.T., FRC formation studies on FRX-C with Z-discharge ionization, 12:17470 (RA;US)
See McKenna, K.F., 12:17474
See Rej, D.J., 12:17469
See Tuszewski, M., 12:17473
Armutlijskij, D.A., Λ hyperon and K/sup 0/ meson production in Cp and CC interactions at 4.2 GeV/c per nucleon, 12:17116 (R;SU;In Russian)
Arnett, C.D., Improved delineation of human dopamine receptors using [18F]-N-methylspiroperidol and PET, 12:16816 (J;US)
Arnot, R.S., Plasma plume effects in pulsed carbon dioxide laser spot welding, 12:16321 (BA;US)
Aronson, S.H., *See* Fischbach, E., 12:17126
Arrieta, L., *See* Guey, C.N., 12:16097
Arsent'ev, V.N., High-voltage cable lead-in for pulse techniques, 12:17485 (R;SU;In Russian)
Arthur, J.R., *See* Vrtis, M.L., 12:17339
Arutyunyan, M.M., *See* Akopova, A.B., 12:16607

Arutyunyan, S.Kh., *See* Akopov, N.Z., 12:16609
Arutyunyan, V.N., Data acquisition and storage system for the e-A experimental setup on the basis of the Ehlektronika-60 microcomputer, 12:16546 (R;SU;In Russian)
Arvieux, J., Giant resonance excitation by inelastic scattering of medium energy ^{12}C ions, 12:17233 (R;FR)
Arvizu, D.E., Progress in photovoltaic concentrator research, 12:15611 (R;US)
Aschoff, A.F., Overview of RP2712-1, interim consensus guidelines on fossil plant cycle chemistry, 12:15720 (RA;US)
Aseev, A.A., *See* Ado, Yu.M., 12:16553
Asfaw, A., Finite difference solution procedure for convection-diffusion problems in irregular geometries, 12:16480 (J;US)
Askarkhodzhaev, A.A., *See* Adam, I., 12:17232
Aslanyan, P.Zh., *See* Arkhipov, V.V., 12:17149
Asratyan, A.E., Anti νn and anti νp interactions in neon nucleus: total cross section ratio and quark-parton analysis, 12:17115 (R;SU)
Experimental comparison of EMC effect in the anti νn and anti νp interactions in neon nucleus, 12:17114 (R;SU)
Astakhov, A.Ya., Realization of one algorithm for track elements isolation in analyzing the images of nuclear interactions, 12:16638 (R;SU;In Russian)
Astvatsaturov, R.G., *See* Arkhipov, V.V., 12:17149
Atabekyan, R.R., Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons, 12:17344 (R;SU;In Russian)
Atcher, R.W., *See* Brechbiel, M.W., 12:16841
Atkins, H.L., *See* Som, P., 12:16824
Atkins, P.G. Jr., *See* Rainisch, R., 12:16116
Atkinson, L.P., Continental shelf processes affecting the oceanography of the South Atlantic Bight: Progress report, June 1, 1986 to May 31, 1987, 12:16933 (R;US)
Atoyan, A.M., *See* Agaronyan, F.A., 12:16942
Atwood, C.L., SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)
Atwood, W.B., Performance of the SLD central drift chamber prototype, 12:16658 (J;NL)
Auchapt, P., CEA R and D contribution to the La Hague extension plant, 12:15379 (R;FR)
Auclair, K.D., Use of CADD/CAE for remote vehicle system mission planning, 12:16455 (J;US)
See Palau, G.L., 12:16454
Audenhove, Van J., *See* De Bievre, P., 12:16389
Auerbach, N., Probing for Dirac vacuum structure in nuclei, 12:17300 (J;NL)
Augerat, J., *See* Alard, J.P., 12:17205
Augustyniak, W., Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)
Aune, B., *See* Mosnier, A., 12:16507
Auvray-Gely, M.H., Irradiation damage in γ-LiA10_2, 12:16326 (R;FR)
Auyang, L., CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)
Avakyan, E.O., *See* Avakyan, R.O., 12:17101
Avakyan, H.R., Suppression of multiple scattering at planar channeling of negative particles, 12:17070 (R;SU)
Avakyan, R.O., Erevan accelerator with a beam small angular divergence, 12:16545 (R;SU;In Russian)
Measurement of the polarization of cumulative protons in $\gamma A \rightarrow pX$ reaction, 12:17101 (R;SU)
Avdejchikov, V.V., Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Averback, R.S., The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
See Cowen, J.A., 12:16255
See Hahn, H., 12:16249
Avetisyan, A.Eh., *See* Avakyan, R.O., 12:16545, 12:17101
Axetell, K. Jr., *See* Zimmer, R.A., 12:16704
Axley, R.G., Cycle chemistry: sampling points and frequencies, presentation, and use of analytical data, 12:15725 (RA;US)
Ayres, D.S., Nucleon decay experiments: status and prospects, 12:17094 (R;US)
Azam, S., *See* Quanci, J., 12:17527
Azhinenko, I.V., Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c, 12:17104 (R;SU;In Russian)
Azizbekyan, G.V., Phase velocity of wave in irregular waveguide in problems of synthesis, 12:16523 (R;SU)
Azmy, Y.Y., *See* Wilson, G.L., 12:16479
Aznauryan, I.G., Electron scattering from light nuclei in the regions of quasi-elastic peak and Δ-isobar excitation, 12:17259 (R;SU)
Azou, P.Y., Behavior of an Inconel 718 container in the presence of hydrogen. Final report, 12:16270 (R;FR;In French)
Azzaro, S.H., *See* Imam, I., 12:15695

B

Baaklini, G.Y., NDE reliability and process control for structural ceramics, 12:16333 (R;US)
Babayan, Kh.P., On the possibility of using a neutron supermonitor in the ANI complex experiment, 12:16604 (R;SU;In Russian)
Babcock, S.E., *See* Mader, W., 12:16267
Babenko, V.A., Study of the P-matrix structure using a potential description of two-particle interaction, 12:17371 (R;SU)
Babinet, R., *See* Alard, J.P., 12:17205
Babonneau, D., Model for the acceleration of laser irradiated targets, 12:17431 (R;FR)
Babu, S.P., *See* Carty, R.H., 12:15271
Bachalo, W.D., *See* Liu, H.T., 12:16725
Bachmann, K.J., Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Bachovchin, D.M., Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)
Bachrach, R.Z., Design and modeling considerations for SSRL Beam Line Wunder, 12:16570 (BA;US)
See Bringans, R.D., 12:16373
Back, B.B., Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
Badalov, S.A., Generating matrix elements of the Hamiltonian of the algebraic version of resonating group method on intrinsic wave functions with various oscillator lengths, 12:17372 (R;SU)
Badalyan, G.V., *See* Arutyunyan, V.N., 12:16546
Bader, S.D., Magnetic properties of novel epitaxial films, 12:16254 (R;US)
Baer, D.R., XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)
Bagdasaryan, D.S., Characteristics of the Erevan synchrotron extracted electron e/sup -//sub 4/beam, 12:16548 (R;SU;In Russian)
EhLEKTRON magnetic spectrometer calibration, 12:16605 (R;SU;In Russian)
Identification of electrons by means of a scintillation telescope at Esub(e) = 1-3 GeV, 12:16606 (R;SU;In Russian)
Bagdinov, V.G., Temperature-dose dependences of porosity parameters in nickel irradiated by 1 meV nitrogen ions, 12:16274 (R;SU;In Russian)
Bagoly, Za., Monopole abundance from first order GUT phase transition of the early Universe, 12:16961 (R;HU)
Bahr, C.C., *See* Barton, J.J., 12:16323
Baier, J., Design and testing of remote handling systems for reprocessing plant maintenance and for nuclear reactor dismantling, 12:15394 (J;US)
Bailey, J.L., *See* Knox, A.E., 12:16542
See Reed, C.B., 12:17518
Baines, K.H., *See* Orton, G.S., 12:16985
Baird, R.D., *See* Rogers, V.C., 12:15457
Bajshev, I.S., Radial distributions of shower energy deposition in hadron and photon hodoscopic sandwich-type calorimeters with cell structure, 12:16616 (R;SU;In Russian)
Baker, C.C., Tokamak power systems studies at ANL, 12:17496 (J;US)
See Finn, P.A., 12:17539
Baker, J., *See* Hahn, H., 12:16249
Baker, L. Jr., *See* Simms, R., 12:16106
Baker, R.B., SIEX3: A correlated computer code for prediction of fast

reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Baker, R.W., Missing data: How does it affect the accuracy of key wind statistics, 12:15636 (BA;US)
See Wade, J.E., 12:15640
Baker, W., *See* Amos, N., 12:16657
Baksay, L., *See* Oddone, P., 12:16654
Bal'butsev, E.B., Closer of the chain of kinetic equation moments and description of the negative-parity collective excitations, 12:17295 (R;SU;In Russian)
Baladi, J.Y., The development of a cavitation free sodium pump for the breeder reactor, 12:15851 (R;US)
Balagurov, A.M., Neutron diffractometer at the IBR-2 reactor. Control system for four-circle goniometer, 12:16484 (R;SU;In Russian)
Balakrishna, S., *See* Griggs, D.P., 12:16125
Balandin, V.P., *See* Aleev, A.N., 12:17118
Balanzat, E., *See* Dural, J., 12:16536
Baldin, A.M., Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
Statistical methods of the description of quark degrees of freedom, 12:17294 (R;SU;In Russian)
Baldin, B.Yu., Cherenkov radiation ring spectrometers with hodoscopic photomultipliers for measurement of particle velocity with momentum up to 300 GeV/c, 12:16613 (R;SU;In Russian)
Baldo, P., *See* Frank, R.C., 12:16302
Baldo, P.M., *See* Rehn, L.E., 12:16257
Ball, P.A., *See* Snow, D.J., 12:15699
Balleux, W., *See* Voorde Van de, N., 12:15428
Ballinger, R.G., Understanding and protecting steam generator materials, 12:15813 (J;US)
Ballou, J.E., Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{233}UO_2(NO_3)_2$ in the rat, 12:16881 (J;US)
Balluffi, R.W., *See* Mader, W., 12:16267
Balsam, W.L., *See* Walsh, J.J., 12:16786
Bame, S.J., *See* Sanderson, T.R., 12:16966
Bamford, W.H., Steam generator vessel and feedwater line integrity issues, 12:15810 (J;US)
Bandini, B.R., *See* Lee, J.D., 12:17534
Bandyopadhyay, K.K., Synthesizing seismic fragility of components by use of existing data, 12:16006 (R;US)
Banerjee, A.K., *See* Knell, K.C., 12:15818
Banerjee, J.R., *See* Anderson, M.S., 12:16444
Banerjee, S., Letter to the Editor, 12:16909 (J;US)
Banerjee, V., *See* Polychronopoulos, C.D., 12:17662
Banks, T., Production of mirror fermions near the Z/sup 0/ peak, 12:17156 (J;NL)
Barabash, I.P., *See* Balagurov, A.M., 12:16484
Baranov, D.S., *See* Ammosov, V.V., 12:17105
Baratta, A.J., *See* Brownson, D.A., 12:16064
Barbour, R.L., *See* Howes, J.E., 12:16715
Barclay, W., Microalgae culture collection, 1986-1987, 12:15613 (R;US)
Bardin, D.Yu., *See* Akhundov, A.A., 12:17152
Barhorst, J.F., *See* Larson, B.C., 12:16305
Bari, R.A., *See* Khatib-Rahbar, M., 12:16102
Barit, I.Ya., On the proton beam characteristic detection in a cyclotron on multiple beam passage through a target, 12:16558 (RA;SU;In Russian)
Barkatt, A., *See* Feng, X., 12:15473
Barker, E.S., *See* Smith, H.J., 12:16988
Barker, J.R., *See* Allamandola, L.J., 12:16941
Barker, J.S., Inversion for source parameters of underground nuclear explosions with implications for yield estimation. Technical report, 5 September 1985-5 March 1986, 12:16681 (R;US)
Barlich, G.L., *See* Campbell, K., 12:15564
Barlow, T.A., Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)
Barnard, J., Levels of uracil DNA glycosylase and AP endonuclease in murine B- and T-lymphocytes do not change with age, 12:16798 (J;CH)
Barnard, J.C., *See* Stokes, G.M., 12:16744
Barnes, C.W., Increased particle confinement with the use of external dc bias field in the CTX spheromak, 12:17449 (RA;US)
See Fernandez, J.C., 12:17452
See Henins, I., 12:17453
See Hoida, H.W., 12:17450
See Knox, S.O., 12:17448
Barnes, D.C., Recent results of an internal tilt mode calculation in FRCs, 12:17475 (RA;US)
Barnes, N.P., Monochromator wavelength measurement device with six figure accuracy, 12:16471 (BA;US)
Red laser initiative at Los Alamos, 12:16469 (BA;US)
Barnett, T.P., Detection of changes in the global troposphere temperature field induced by greenhouse gases, 12:16734 (J;US)
Baron, J., Effect of hygroscopicity on aerosol behavior, 12:16103 (J;US)
Baron, J.S., *See* Maneke, J.L., 12:16108
Barot, D.T., *See* Richter, G.N., 12:15288
Barr, E.B., *See* Mauderly, J.L., 12:16893
See Wolff, R.K., 12:16894
Barr, W.L., *See* Henning, C.D., 12:17499
Barry, D.C., *See* Holberg, J.B., 12:17020
Barry, J.E., Nuclear fuels accounting interface: River Bend experience, 12:15778 (J;US)
Barsukov, A.B., Systematic errors in field measurements in a hf quadrupole focusing accelerator, 12:16524 (R;SU;In Russian)
Bartak, V., Present state and prospects of calculation techniques of seismic engineering at Energoprojekt Praha, 12:15968 (RA;CS;In Czech)
Bartalucci, S., Status of ADONE as synchrotron radiation source, 12:16575 (RA;US)
Bartel, T.J., Numerical simulation of an ICF target explosion in a stratified gas atmosphere, 12:17566 (J;US)
Bartlett, R.J., Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Bartlit, J.R., *See* Anderson, J.L., 12:17544
Barton, J.J., Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Bartsch, R.R., *See* Davis, H.A., 12:16497
Basko, M.M., Equations of one-dimensional radiative hydrodynamics with thermal conductivity and kinetics of thermonuclear burning, 12:17436 (R;SU;In Russian)
Bastin, G., *See* Bimbot, R., 12:16559
Bates, A.J., Fossil plant water chemistry - C.E.G.B. approach and experience, 12:15727 (RA;US)
Bates, J.K., *See* Ebert, W.L., 12:15413
Bathke, C.G., *See* Miller, R.L., 12:17502, 12:17503
Batlogg, B., *See* Willis, J.O., 12:16285
Baton, J.P., Survey of research in elementary particle physics, 12:17128 (R;FR;In French)
Battaglia, Heat capacities of rare gases adsorbed on graphite. Technical report, 12:16345 (R;US)
Batte, G.L., *See* Seidel, B.R., 12:16016
Battles, J.E., *See* Brown, A.P., 12:16253
Batuman, V., *See* Jones, K.W., 12:16885
Batunin, A.V., Leptoproduction of nuclei as an analogue to production in hadron-hadron interactions (at the example of J/psi), 12:17131 (R;SU)
Batyunya, B.V., *See* Baldin, A.M., 12:17201
Batyunya, E.V., Analysis of elastic scattering in anti pp interactions at 22.4 GeV/c, 12:17117 (R;SU;In Russian)
Bauer, G.J., *See* Brown, P.E., 12:16460
Bauer, T.H., *See* Holland, J.W., 12:15978
Baum, W.A., Planetary research at Lowell Observatory, 12:16995 (RA;US)
Baumann, B.L., *See* Miller, C.E. Jr., 12:15542
Baumler, J., Possible short and long term evolution in the cost of PWRs nuclear fuel and coal, 12:15405 (RA;XA)
Bautz, R.A., Development of a maintenance free 10 KW windgenerator, 12:15664 (BA;US)
Baxter, D.J., Protective coatings and claddings: Application/evaluation, 12:15272 (R;US)
Baxter, N., *See* Kruger, W., 12:15692
Baxter, S.M., *See* Thompson, M.E., 12:16414
Bayanov, B.F., *See* Alferov, V.N., 12:16554
Bayatyan, G.L., On the growth of hadronic photoabsorption cross-section, 12:17102 (R;SU)
Bayless, P.D., *See* Adams, J.P., 12:16026
Baylis, W.E., *See* Pascale, F., 12:17064
Bayukov, Yu.D., Correlations between neutrons with small relative momenta produced in p-Pb interactions at 7,5 GeV/c, 12:17238 (R;SU)
Bazzaz, F.A., *See* Garbutt, K., 12:16910
Beall, G.H., *See* Lempicki, A., 12:16472
Bean, R.M., Analysis of DNA adducts using trace organic analytical techniques, 12:16896 (RA;US)
See Cataldo, D.A., 12:16891
Beard, B.C., Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)

Beard, P.M., Long-range goal setting in the nuclear utility industry, 12:15787 (J;US)
Beaudoin, B.R., *See* Tessler, G., 12:15864
Bechtold, R.A., Reactor cover gas monitoring at the Fast Flux Test Facility, 12:15984 (R;US)
See Lutton, J.M., 12:15852
Beck, H.L., Dose rate conversion factors, 12:17335 (J;US)
Beck, W.K., Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
Beck, W.L., Experience gained during remedial action at residential properties contaminated with Th-232 and Ra-226, 12:15547 (RA;US)
Beck, W.N., *See* Pahl, R.G., 12:15848
Becker, H.D., *See* Beck, W.K., 12:17608
Becker, M., Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report, 12:15618 (R;DE;In German)
Becker, O., MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)
Becker, R.L., *See* Wong Cheukyin, 12:17084
Becker, U., *See* Shirley, D.A., 12:16531
Bedrosian, G., *See* Chari, M.V.K., 12:15706
Beg, M.A.B., Scalar sector of gauge theories and the quest for a unified theory, 12:17186 (BA;NL)
Beggs, W.J., *See* Tessler, G., 12:15864
Behnsen, J., Energy conservation, 12:16165 (RA;DE;In German)
Behrens, J.W., Advances in the use of ^{3}He in gas scintillation counters, 12:16669 (J;US)
Behringer, K., Digital generation of stochastic signals of arbitrary spectral shape, 12:15925 (R;CH)
Behrisch, R., *See* Ehrenberg, J., 12:17435
Beier, E.W., *See* Ayres, D.S., 12:17094
Bel'skij, N.P., Experimental study of two-beam resonator accelerator in a pulse mode, 12:16515 (R;SU;In Russian)
Bell, J.F., Infrared spectral studies of asteroids, 12:16996 (RA;US)
Bell, J.T., *See* Mailen, J.C., 12:15441
Bell, M., *See* Sheffield, J., 12:17492
Bell, R.J., *See* Impagliazzo, A.M., 12:15715
Bellan, P.M., Mode beating model of ac helicity injection, 12:17478 (RA;US)
Bellows, J.C., Steam purity recommendations - the Westinghouse experience, 12:15714 (RA;US)
Belogorlov, E.A., Low-energy neutron spectra behind the IHEP accelerator shields, 12:16556 (R;SU;In Russian)
Beloshitskij, V.V., *See* Avakyan, H.R., 12:17070
Belshe, R.A., High-rate CAMAC aquisition system, 12:16651 (J;NL)
Belyaev, O.K., *See* Barsukov, A.B., 12:16524
Belyaev, V.B., Solution of Faddeev differential equations for scattering problem in three identical particle system. Calculation algorithm. The finite-dimensional approximation method, 12:17177 (R;SU;In Russian)
Bem, P., Investigation of charge symmetry violation in d+d mirror reactions at low energies, 12:17278 (RA;CS)
Bement, T.R., Efficiencies of CSP plans in quality control, 12:15954 (BA;US)
Bendl, J., *See* Jursova, L., 12:16628
Bendow, B., *See* Tallant, D.R., 12:16334
Benedict, R.P., *See* Hurwitz, M.J., 12:15693
Bengel, P.R., Robotics development at TMI-2, 12:16129 (J;US)
Benko, G., Cosmic ray fluctuations at rigidities 4 to 180 GV, 12:16962 (R;HU)
Benmekki, E.H., Accurate vaporizing gas-drive minimum miscibility pressure prediction, 12:15359 (BA;US)
Benner, D.C., HALOE science investigation. Semiannual progress report, February-July 1986, 12:16705 (R;US)
Bennett, C.L., FFTF fuel rotation for extended burnup, 12:15996 (J;US)
Bennett, G.W., *See* Bizais, Y.J., 12:16821
Bennett, J.W., Materials aspects of nuclear waste isolation, 12:15486 (BA;US)
Bennett, L.L., Presentation of the results of the seminar on cost and financing of nuclear power programmes in developing countries, 12:15878 (RA;XA)
Bennett, M.J., *See* Shera. E.B., 12:17224
Bennett, P., *See* Kunze, J.F., 12:17537
Bennett, P.R., Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
Bennett, R.A., *See* Campbell, L.R., 12:15861
Bennett, R.H., Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
Beno, M.A., *See* Whangbo, M., 12:16412
See Williams, J.M., 12:16416
Benson, R.C., Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)
Benz, A.O., Particle acceleration by turbulent plasmas, 12:16946 (RA;CS)
Beppler, E., Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
Bercaw, J.E., *See* Thompson, M.E., 12:16414
Berezin, F.N., *See* Kisurin, V.A., 12:16490
Berger, E.L., Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)
Berger, R.E., Continuous Bayesian updating; Normal and two stage, 12:16095 (J;US)
Bergman, W., *See* Biermann, A.H., 12:16916
Bergstralh, J.T., *See* Orton, G.S., 12:16985
Berkner, K.H., Advanced Light Source, a 1-2 GeV synchrotron radiation facility, 12:16589 (RA;US)
See Schlachter, A.S., 12:17081
Berko, S., *See* Fluss, M.J., 12:16307
Berkvens, P., *See* Ryckbosch, D., 12:17274
Berlande, J., *See* Mestdagh, J.M., 12:17063
Berman, M., Containment loads due to hydrogen combustion, 12:16144 (BA;CA)
See Marshall, B.W. Jr., 12:16062
Bernard, J.A., Human approach to process control and the provision of predictive information, 12:16069 (J;US)
Berry, F.O., *See* Anderson, G.L., 12:15270
Berry, G.F., Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air, 12:15326 (R;US)
Berry, M., Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions, 12:17668 (BA;US)
Bertani, M., *See* Amos, N., 12:16657
Berthelot, C., Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
Berthier, E., *See* Louis-Jacquet, M., 12:16463
Bertone, P., *See* Quanci, J., 12:17527
Bertucio, R., Summary of core damage frequency from internal initiators: Surry, 12:16081 (J;US)
Summary of core damage frequency from internal initiators: Sequoyah, 12:16083 (J;US)
Berwald, D., *See* Abdou, M., 12:17529
See Wagner, C.E., 12:17500
Berwald, D.H., *See* Whitley, R.H., 12:17504
Besen, M.M., *See* Beck, W.K., 12:17608
Besmann, T.M., Assessment of ceramic composites for multimegawatt space nuclear power systems, 12:15867 (R;US)
Best, F.R., Two-phase flow demonstration device, 12:16482 (J;US)
Beswick, J.A., Dissociation dynamics of van der Waals molecules, 12:17074 (RA;CS)
Betak, E., Neutron-gamma coincidence calculations within the pre-equilibrium model, 12:17273 (RA;CS)
Walkers, slaves or both?, 12:17275 (RA;CS)
Betten, P.R., Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime, 12:15865 (J;US)
Betzer, P.R., *See* Walsh, J.J., 12:16786
Beurskens, J., Review of standards/codes of practice related to safety and reliability of wind energy conversion systems, 12:15648 (BA;US)
Beuttenmuller, R., Performance of a novel silicon detector, 12:16660 (J;NL)
Bezhunov, G.M., Investigation of time evolution of leakage neutron spectra from the surface of a molybdenum sphere in the nanosecond range, 12:17309 (R;SU;In Russian)
Bezia, C., *See* Gauchon, J.P., 12:15772
Bezzon, G., *See* Della Mea, G., 12:16349

Biancaniello, F., *See* Tsang, K.L., 12:16293
Bibilashvili, Yu.K., *See* Solyany, V.I., 12:15797, 12:16021
Bicak, J., Asymptotic behaviour of Robinson-Trautman pure radiation solutions, 12:17385 (R;HU)
Einstein's Prague ideas on gravitation: the history and the present, 12:17363 (RA;CS)
Bice, D.E., *See* Mauderly, J.L., 12:16893
Bidlingmaier, W., Studies on heavy metals in household refuse and on heavy metals concentration in certain fractions or groups of materials by suitable treatment, 12:16774 (R;DE;In German)
Biedenharn, L.C., *See* Rinker, G.A., 12:17351
Biermann, A.H., Filter penetration measurements using the condensation nuclei counter and the aerosol photometer, 12:16916 (R;US)
Biggs, G.L., A laser Doppler method for noninvasive measurement of flow velocity, 12:16478 (R;US)
Bigi, I., Heavy flavour decays and the structure of weak interactions, 12:17132 (R;DE)
Bigi, I.I., CP violation in heavy flavor decays: Predictions and search strategies, 12:17157 (J;NL)
Biljetina, R., *See* Anderson, G.L., 12:15270
See Srivastava, V., 12:15585
Billman, K.W., *See* Pendergrass, J.H., 12:17563
See Waganer, L.M., 12:17621
Billon, A., Measurements of transuranium trace amounts in solution. Bibliographic study, 12:16387 (R;FR;In French)
Bimbot, R., Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)
Bingham, G.E., Design and construction status of the fuel processing facility, 12:15392 (J;US)
Binney, S.E., *See* Harris, R.D., 12:15827, 12:16126
Birkhoff, G., Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems, 12:16385 (R;FR)
Birtcher, R.C., Precipitation of Kr in Ni at room temperature, 12:16262 (R;US)
Bistirlich, J., *See* Breunlich, W.H., 12:17207
Bistrian, J., *See* Imai, M., 12:15832
Bitensky, M.W., *See* Whalen, M.M., 12:16797
Biwer, R.L., *See* DeLuca, W.H., 12:16149
Bizais, Y.J., Linearity and energy corrections for scintillation cameras used in quantitative single photon emission computed tomography, 12:16821 (J;US)
Bjoerkstroem, A., One-dimensional and two-dimensional ocean models for predicting the distribution of CO_2 between the ocean and the atmosphere, 12:16751 (BA;US)
See Moore, B. III, 12:16784
Bjoernsson, C.I., Frequency dependent polarization in blazars, 12:17043 (R;DK)
Blackett, A.D., *See* Freeman, S.E., 12:16882
Blackfield, D.T., *See* Galambos, J.D., 12:17535
Blackmon, M.L., *See* Pitcher, E.J., 12:16699
Blackmond, D.G., Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
Blake, J.B., Contributions to the 18th International Cosmic Ray Conference, 12:16935 (R;US)
Secondary production of gamma rays in the Jovian magnetosphere, 12:16937 (RA;US)
Stellar upper mass limit in an OB association and implications for cosmic rays and cosmic abundances, 12:16938 (RA;US)
Versatile Data Processing Unit (DPU) for satellite-borne composition instrumentation, 12:16939 (RA;US)
See Margolis, S.H., 12:16936
Blanchard, J.P., The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
Blank, H., On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Blaseck, K., *See* Baier, J., 12:15394
Blasing, T.J., Tree ring chronology indexes and reconstructions of precipitation in Central Iowa, USA, 12:16689 (R;US)
Blatchley, C.C., *See* Sioshansi, P., 12:15704
Bledsoe, J.L., *See* Hively, L.M., 12:15554
Bloembergen, N., *See* Steinbeck, J., 12:17352
Blomquist, C.A., *See* Simms, R., 12:16106
Blomquist, R.N., *See* Knox, A.E., 12:16542
Blood, F.X., EEI chemistry committee perspective - current US utility practices, 12:15719 (RA;US)
Bloom, E.E., Structural materials for fusion reactor blanket systems, 12:17627 (BA;US)
Bloomfield, D., Interaction of trace species with the molten carbonate fuel cell: Task report No. 12, 12:16193 (R;US)
Blotcky, A.J., Applications of a low power nuclear reactor, 12:15994 (RA;XA)
Blume, M., *See* Galayda, J.N., 12:16504
Boatner, L.A., *See* Abraham, M.M., 12:16343
Bobis, J.P., Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
See Sheen, S.H., 12:16599
Bobula, G.A., Compound cycle engine program, 12:16228 (R;US)
Boehm, J., New dose quantities for personnel dosemeters. Results of the intercomparison program 1985 - seminar report, 12:16649 (R;DE;In German)
Boehm, R.F., *See* Dunn, J.C., 12:15630
Boehmer, H., *See* Wagner, C.E., 12:17542
Boercker, S.W., Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)
Boerio, F.J., *See* Koenig, J.L., 12:15604
Boerner, A.J., *See* Deming, E.J., 12:15526
Bogart, S.L., Demountable toroidal fusion core facility for toroidal physics optimization and fusion engineering research, 12:17586 (J;US)
Bogdanovich, E., *See* Armutlijskij, D.A., 12:17116
Bogdonoff, P., *See* Hall, C.A.S., 12:16765
Boguslavskij, I.V., *See* Batyunya, E.V., 12:17117
Boland, J.R., *See* Atwood, C.L., 12:17330
See Williams, R.E., 12:15418
Boles, D.G., *See* Hurwitz, M.J., 12:15693
Bolin, B., Requirements for a satisfactory model of the global carbon cycle and current status of modeling efforts, 12:16754 (BA;US)
Bollenbacher, M., *See* Cole, L.W., 12:15550
Bollinger, L.M., *See* Pardo, R.C., 12:16541
Bonaca, M.V., Evaluating the safety of nuclear plant changes, 12:16112 (J;US)
Bond, J.A., Metabolism of chemical mixtures by the lower respiratory tract, 12:16890 (RA;US)
See Dahl, A.R., 12:16889
See Wolff, R.K., 12:16894
Bondarenko, O.A., Radioactive contaminations of materials for low-background setups, 12:16643 (R;SU;In Russian)
See Zdesenko, Yu.G., 12:16644
Bondy, R., Radiation processing technology for feed mixes and litter for laboratory animals, 12:16847 (RA;CS;In Czech)
See Hanis, T., 12:16846
Boni, A.A., Transformations of inorganic coal constituents in combustion systems: Quarterly report No. 1 for the period October-December 1986, 12:15328 (R;US)
Bonifacio, R., *See* Murphy, J.B., 12:16468
Bonin, B., *See* Arvieux, J., 12:17233
Bonniaud, R., *See* Auchapt, P., 12:15379
Bonse, U., *See* Johnson, Q.C., 12:16397
Boone, D.A., *See* Brummert, A.C., 12:15360
Boos, E.E., *See* Arbuzov, B.A., 12:17163
Bopp, C.D., *See* Holladay, D.W., 12:15534
Borak, T.B., *See* Gonsalves, L.L., 12:15497
See Kark, J.B., 12:15532
See Provencher, R., 12:15530
Borchers, W.A., Development of a microcomputer data base of manufacturing, installation, and operating experience for the NSSS designer, 12:15918 (J;US)
Borden, W.C., Comparisons of passive environmental radon monitors (PERMs) and track etch (R) radon detectors during remedial actions at the Niagara Falls Storage Site, 12:15513 (RA;US)
Health physics and operational experience gained from slurry transfer of wastes containing 780 curies of radium-226, 12:15556 (RA;US)
Boreel, L.J., The Netherlands wind energy research and development program, 12:15656 (BA;US)
Borg, I.Y., Nuclear explosives for peaceful purposes, 12:16683 (R;US)
Borgwaldt, H., SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
Borja, M.A., A low cost and easy to reproduce anemometer for basic wind data acquisition, 12:15633 (BA;US)

A proposed method for processing data on wind energy conversion systems testing, 12:15655 (BA;US)
Borja, R.E., *See* Borja, M.A., 12:15655
Bornyakov, V.G., Model of nonrelativistic quarks in self-consistent field, 12:17130 (R;SU;In Russian)
Borodyuk, V.P., Dialogue scanning measuring systems, 12:16637 (R;SU;In Russian)
Bossy, H., *See* Breunlich, W.H., 12:17207
Botner, O., Fragmentation of jets produced in hard p anti p collisions at the ISR, 12:17119 (R;DK)
Bottcher, J.H., Breached pin performance in the EBR-II RBCB program, 12:15977 (R;US)
Botter, F., *See* Lefevre, F., 12:17429
See Roth, E., 12:17428
Botto, R.E., *See* Winans, R.E., 12:15300
Boucher, R., *See* Tice, R.R., 12:16900
Bougault, A., *See* Tavassoli, A.A., 12:16245
Boughton, B.A., An integral model of plume rise from high explosive detonations, 12:16679 (R;US)
Bourgade, J.L., Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Bourgeois, M., *See* Auchapt, P., 12:15379
Bourke, W., *See* Pitcher, E.J., 12:16699
Bourque, R.F., *See* Schultz, K.R., 12:17505
See Wong, C.P.C., 12:17515
Bowell, E.L.G., Studies of asteroids and comets, 12:16997 (RA;US)
See Baum, W.A., 12:16995
Bowen, W.W., Interfacing robotics with plutonium fuel fabrication, 12:15377 (R;US)
Bowerman, B.S., *See* Siskind, B., 12:15439
Bowers, D.A., *See* Harris, D.B., 12:17558
Bowersox, D.F., *See* Rense, C.E.C., 12:16282
Bowman, D.R., *See* Fitzpatrick, D.K., 12:16492
See McMahan, M.A., 12:16650
Bowman, D.W., *See* Cleveland, W.E., 12:15697
Bowman, H.R., *See* Mathews, M.A., 12:15347
Bowman, J.C., *See* Boyce, M.P., 12:15689
Bowman, R.M.J., Start-up support and trouble shooting for multi-bearing machine, 12:15686 (RA;US)
Box, W.D., Drop tests of the Three Mile Island knockout canister, 12:15800 (R;US)
Boyack, B., *See* Shire, P., 12:16088
Boyakhchyan, E.M., *See* Bagdasaryan, D.S., 12:16548, 12:16605
Boyar, R.E., *See* Devolpi, A., 12:16014
Boyce, M.P., Detection of turbomachine blading problems using on and off-line monitoring, 12:15689 (RA;US)
Boyer, C., Upper atmosphere of Venus: a tentative explanation of its rotation, 12:17054 (TJ;US)
Boyer, D., *See* Thomas, G.E., 12:16538
Boyer, J.N., Anaerobic chitin degradation as a carbon and hydrogen source for sulfate reduction and methanogenesis in salt marsh bacteria, 12:16826 (RA;US)
Boyle, G.A., The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)
Bozoian, M., Correlation technique for single- and two-phase pump data, 12:15953 (J;US)
Bozoki, G., *See* Cho, N., 12:16099
Braby, L.A., Application of microdosimetry techniques in health physics, 12:17323 (RA;US)
Improving the precision and range of cell survival assays, 12:16865 (RA;US)
Linear energy transfer (LET) effects on repair rate, 12:16864 (RA;US)
Positive ion irradiation facility, 12:16862 (RA;US)
See Metting, N.F., 12:16866, 12:16868
See Nelson, J.M., 12:16867
Brackbill, J.U., *See* Milroy, R.D., 12:17461
Brackenbush, L.W., *See* Faust, L.G., 12:16875
Bradley, R.S., Climatic data for Northern Hemisphere land areas 1851-1980, 12:16693 (R;US)
Bradshaw, A.L., *See* Brewer, P.G., 12:16785
Bradshaw, A.M., *See* Muelhaupt, G., 12:16573
Brady, L.A., *See* Metting, N.F., 12:17320
Brady, V.O., *See* Hovingh, J., 12:17616
Brager, H.R., *See* Garner, F.A., 12:16277
Braid, T.H., *See* Devolpi, A., 12:16014
Bramlett, E., *See* Vesper, B.E., 12:15521, 12:15528
Branagan, E.F. Jr., Disposal of slightly contaminated radioactive wastes from nuclear power plants, 12:15540 (RA;US)
Brandt, J.C., Atlas of Comet Halley 1910 II, 12:16999 (RA;US)
Imaging studies of comets, 12:16998 (RA;US)
Brase, J.M., *See* Johnson, Q.C., 12:16397
Braun, C., Electric Power Research Institute (EPRI) study on small and medium power reactor concepts having present potential for the USA, 12:15875 (RA;XA)
Braun, P.F., Cobalt processing - flask positioner location sensing system, 12:15843 (J;US)
Braunstein, G., *See* Steinbeck, J., 12:17352
Breakstone, A., Study of gluon scattering and gluon fragmentation in high P/ sub T/ interactions at the ISR, 12:17121 (J;DE)
Brechbiel, M.W., Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Brehm, W.F., *See* Lutton, J.M., 12:15852
Breniser, J.S., *See* Mattox, G.C., 12:16164
Brenner, D.J., *See* Miller, J.H., 12:17321, 12:17322
Brereton, S.J., *See* Jalbert, R.A., 12:17551
Breun, R.A., *See* Brouchous, D.A., 12:17423
Breunlich, W.H., Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
Brewer, P.G., Measurements of total carbon dioxide and alkalinity in the North Atlantic Ocean in 1981, 12:16785 (BA;US)
Briancon, Ch., *See* Inoyatov, A.Kh., 12:16636
Bride, J., *See* Dean, A., 12:15321
Brill, A.B., *See* Bizais, Y.J., 12:16821
See Lipman, J.J., 12:16884
See Som, P., 12:16824
Bringans, R.D., The surface electronic structure of GaAs(100) and GaAs(111) from angle resolved photoemission, 12:16373 (BA;US)
See Bachrach, R.Z., 12:16570
Brinner, A., Measurement of radiation intensity at the solar tower plant SSPS/CRS of the IEA in Spain, 12:15621 (TG;FR)
Bristowe, P.D., *See* Payne, M.C., 12:16266, 12:16354
Britten, J.A., *See* Visser, W., 12:15331
Britvich, G.I., *See* Belogorlov, E.A., 12:16556
Britz, J., *See* Antony, M.S., 12:17218
Brock, S., *See* Gao, H.W., 12:15358
Brodelle, J., Present situation of export credits, 12:15901 (RA;XA)
Broecker, W.C., Gas exchange measurements in natural systems, 12:16789 (BA;US)
Brog, T.K., Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Broj, K., *See* Jursova, L., 12:16628
Bromberg, L., *See* Cohn, D.R., 12:17543
Bronikowski, M.J., *See* Hopkins, M.D., 12:16410
Brooks, A.L., Comparative in vitro and in vivo models of cytotoxicity and genotoxicity, 12:16901 (RA;US)
See Dahl, A.R., 12:16889
Brooks, E.T., *See* Jones, D.F., 12:15461
Brooks, J.N., *See* Baker, C.C., 12:17496
See Finn, P.A., 12:17539
Brookshier, W., Log amplifier with pole-zero compensation, 12:16494 (P;US)
Brosey, B., *See* Distenfeld, C.H., 12:16013
Brouchous, D.A., Parallel current flow in the Phaedrus tandem mirror machine, 12:17423 (BA;US)
Brouns, R.A., Nuclear Waste Treatment Program: Qualification of commercial high-level waste forms: Approach and status, 12:15445 (R;US)
Brown, A.P., The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
Brown, B.S., *See* Knox, A.E., 12:16542
Brown, C., *See* Ehrlich, K., 12:16244
Brown, D.A., Integrated defueling system for Three Mile Island Unit 2, 12:16127 (J;US)
Brown, D.C., *See* Smith, S.T., 12:15565
Brown, G.J., *See* Husain, A., 12:15936
Brown, J.A., *See* Dendahl, K.H., 12:15524
See Gaffney, E.S., 12:16678
Brown, L.W., Composition of faint comets, 12:17000 (RA;US)
Brown, M.A., Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)
Brown, P.E., Update on active facilities at Harwell, UK, 12:16460 (J;US)
Brown, P.J., *See* Lander, G.H., 12:16313
Brown, P.S., Nuclear weapon R and D and the role of nuclear testing, 12:16684 (R;US)
Brown, R.D., *See* Irvine, W.M., 12:17025
Brown, R.H., Infrared observations of small solar-system bodies, 12:17001 (RA;US)

Search for volatiles in the surface of icy satellites, 12:16972 (RA;US)
Brown, S., *See* Drake, J., 12:15622
Brown, T.G., Configuration development and structural assessment of the FEDC Ignitor concept, 12:17494 (J;US)
See Flanagan, C.A., 12:17493
Browne, J.C., Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)
See O'Dell, R., 12:17670
Browning, P.K., Coronal heating by magnetic tearing turbulence, 12:16948 (RA;CS)
Brownson, D.A., Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Bruge, G., *See* Arvieux, J., 12:17233
Bruijn, D.P. de, *See* Los, J., 12:17073
Brummert, A.C., Economic evaluation of a CO/sub 2/-enhanced oil recovery flood at the Rock Creek Field, Roane County, West Virginia, 12:15360 (BA;US)
Brumovsky, M., Monitoring radiation damage of reactor structural materials, 12:15949 (RA;CS;In Czech)
Bruneau, J., *See* Busquet, M., 12:16464, 12:17060
Bruntsko, D., *See* Batyunya, E.V., 12:17117
Bruynseraede, Y., *See* Locquet, J.P., 12:17354
Bryan, M.A., *See* Morris, C.L., 12:17212
Brynich, J., *See* Petrovsky, V., 12:16052
Bryson, M.C., *See* Bement, T.R., 12:15954
Buchenauer, C.J., *See* Hoida, H.W., 12:17450
Bucher, F., Shrinkage experiments on bentonite samples, 12:15432 (R;CH;In German)
Bucher, W., *See* Becker, M., 12:15618
Buchnev, V.N., Energy dependence of some neutron dosimeter sensitivities in the 1 eV up to 4 keV energy range, 12:16641 (R;SU;In Russian)
Buckau, G., *See* Kim, J.I., 12:16429
Buckman, K.J., *See* Ritter, J.E., 12:16330
Budding, K.E., Low-temperature geothermal assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah, 12:15625 (R;US)
Budtz-Joergensen, C., *See* Straede, Ch., 12:17246
Bugorskij, A.P., *See* Ammosov, V.V., 12:17105
Bukhbinder, I.L., Quantum field theory renormalization in curved space-time and renormalization group equations, 12:17167 (R;SU;In Russian)
Bulls, A.R., *See* Thompson, M.E., 12:16414
Bulmer, R.H., *See* Henning, C.D., 12:17499
Bunch, R.M., *See* Abraham, M.M., 12:16343
Bunker, B.C., Effect of surface corrosion on glass fracture, 12:16365 (BA;US)
Waste glass leaching: Chemistry and kinetics, 12:15448 (R;US)
Buras, B., European Synchrotron Radiation Facility, 12:16587 (RA;US)
Burchill, W.E., Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
Burd, W.C., Graphics NC generation in a prototype machining laboratory: CAM report, 12:16445 (R;US)
Burda, T.J., Significance of upper air meteorological conditions in Altamont Pass wind resource assessment, 12:15635 (BA;US)
Burda, Z., *See* Bondy, R., 12:16847
Burdick, L.J., *See* Barker, J.S., 12:16681
Burger, B.J., *See* Thompson, M.E., 12:16414
Burger, J., Nucleon-nucleon scattering in a nonrelativistic quark model, 12:17133 (R;DE;In German)
Burger, R.W., *See* Barker, J.S., 12:16681
Burgeson, J.E., *See* Gurol, H., 12:17607
Burgher, L.M., Micro-to-Mainframe Communication Standard: Subsystem design analysis report, 12:17658 (R;US)
Burin, K., *See* Inoyatov, A.Kh., 12:16636
Burke, T.M., *See* Campbell, L.R., 12:15861
Burkhart, R.D., Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986, 12:16402 (R;US)
Burnett, R.B., *See* Chaudhuri, U.N., 12:16906
Burnham, A.K., *See* Singleton, M.F., 12:15373
Burns, J.T., *See* Bennett, R.H., 12:15450
Burns, W.J., *See* Anderson, C.K., 12:15781
Burnside, R.J., Flux flattening in a graphite-moderated core, 12:15842 (J;US)
Burrage, L.M., Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)
Burris, L., The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor, 12:15383 (R;US)
Bursik, A., Adoption of water chemistry principles in fossil power plant design and operation, 12:15728 (RA;US)
Burson, S.B., *See* Greene, G., 12:16107
Burtsev, V.A., Calibration of thermonuclear neutron detectors, 12:17414 (R;SU;In Russian)
Burwell, C.C., Electricity and the pulp and paper industry, 12:16218 (R;US)
Roles for electricity in transportation, 12:16209 (R;US)
Roles of electricity: Pulp and papermaking, 12:16219 (R;US)
Roles of electricity: Electric steelmaking, 12:16220 (R;US)
The role of electricity in glass making, 12:16217 (R;US)
Bus, S.J., *See* Bowell, E.L.G., 12:16997
Buschbom, R.L., *See* Ballou, J.E., 12:16881
See Sullivan, M.F., 12:16880
Bushaw, B.A., *See* Whitaker, T.J., 12:16392, 12:16393
Bushnell, C.W., *See* Spampinato, P.T., 12:17570
Busquet, M., Ionization model for nickel-like gold, 12:16464 (R;FR)
Population model for nickel-like gold which transitions to discard, 12:17060 (R;FR)
See Combis, P., 12:17398
Butenko, V.A., TV event recorder, 12:16630 (R;SU;In Russian)
Butler, N.G., *See* Wade, J.E., 12:15640
Byers, C.H., *See* Hughes, J.A., 12:16407
Byers, F.M. Jr., *See* Norris, A.E., 12:16918

C

Cabayan, H.S., Energy and Technology Review, November 1986, 12:17488 (R;US)
Cadena-Fix, C.A., *See* da Roza, R.A., 12:16915
Cahalan, J.E., Safety aspects of LMR [liquid metal-cooled reactor] core design, 12:16015 (R;US)
Cahn, J.H., Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Calame Longjean, A., *See* Faugeras, P., 12:15380
Calando, J.P., Tritium detection in installations and in environment, 12:17425 (R;FR;In French)
Caldera, E., *See* Borja, M.A., 12:15633
Caldwell, C.S., *See* Hoovler, G.S., 12:16067
Caldwell, J., Theoretical and observational planetary physics, 12:16973 (RA;US)
Callan, J.E., Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant, 12:15477 (J;US)
Callcott, T.A., *See* Tsang, K.L., 12:16293, 12:17353
Calo, J.M., Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
See Suuberg, E.M., 12:15298
Calovoio, M., *See* Giaquinto, L., 12:15659
Calvet, J.N., *See* Richard, A., 12:16246
Calza Bini, A., *See* Ehrlich, K., 12:16244
Cameron, E.N., *See* Kulcinski, G.L., 12:17625
Camp, A.L., *See* Harper, F.T., 12:16080, 12:16085
Campanini, R., *See* Breakstone, A., 12:17121
Campbell, D.O., *See* Mailen, J.C., 12:15441
Campbell, J.S., Preliminary report on the field testing of latest model Campbell Chinese-type windmill, 12:15662 (BA;US)
Campbell, K., Fundamental data analyses for measurement control, 12:15564 (R;US)
Campbell, L.R., Reactivity worth of gas expansion modules (GEMs) in the fast flux test facility, 12:15861 (J;US)
Campbell, R.B., In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Campbell, T.G., *See* Gray, L.W., 12:15385
Campins, H., Infrared imaging and photometry of Comet Giacobini-Zinner, 12:17002 (RA;US)
Canlano, R.J., *See* Murphy, G.L., 12:15552
Cannon, B.D., Laser analysis of directly injected supercritical fluids, 12:16394 (RA;US)
See Whitaker, T.J., 12:16393
Canova, G.R., *See* Rollett, A.D., 12:16283

Cantwell, B.J., *See* Ferziger, J.H., 12:16433

Cape, J.A., Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986, 12:15614 (R;US)

Caponi, M.Z., *See* Wagner, C.E., 12:17542

Capps, R., *See* Pendleton, Y., 12:17035

Cargnelli, M., *See* Breunlich, W.H., 12:17207

Carjan, N., *See* Delagrange, H., 12:17260

Carlson, R.E., *See* Hearst, J.R., 12:15348

Carlson, R.V., *See* Nasise, J.E., 12:17545

Carne, T.G., *See* Lauffer, J.P., 12:15654

Carpenter, B.S., *See* De Bievre, P., 12:16389

Carpenter, D., *See* Gonsalves, L.L., 12:15497

Carpenter, J.M., *See* Knox, A.E., 12:16542

Carpenter, M.P., *See* Riedinger, L.L., 12:17235

Carpenter, R., *See* Peterson, M.L., 12:16929

Carpenter, R.W., *See* Lowndes, D.H., 12:16368

Carr, D.B., *See* Cowley, P.J., 12:17656

Carr, J., *See* Atwood, W.B., 12:16658

Carrazza, J., Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K, 12:15297 (J;US)

Carre, F., Composite beryllium-ceramics breeder pin elements for a gas cooled solid blanket, 12:17426 (R;FR)

Carroll, M.C., A model for first-wall thermal response to plasma energy deposition, 12:17517 (J;US)

Carson, C.F., *See* Garner, J.K., 12:17512
See McCarville, T.J., 12:17591

Carter, K.D., *See* Vanosdell, D.W., 12:15739

Carter, L.L., *See* Morford, R.J., 12:16518

Carty, R.H., Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)

Casadei, A.L., *See* Liu, Y.S., 12:15815

Casadevall, T.J., *See* Gerlach, T.M., 12:16740

Case, A.C., *See* Ballou, J.E., 12:16881

Case, M.J., *See* Dolenc, M.R., 12:15551

Cassagnou, Y., Formation and decay of hot nuclei, 12:17240 (R;FR)
See Mostefai, M., 12:17241
See Pollacco, E.C., 12:17227

Casser, E., Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)

Castellan, R.M., Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)

Castellana, F., *See* Sedaghat, A., 12:15942

Castle, R., *See* Mann, G.M.W., 12:15799

Castor, J.G., *See* Bobula, G.A., 12:16228

Cataldo, D.A., Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)

Cathey, N., *See* Kolaczkowski, A.M., 12:16082

Catlin, J.B. Jr., Benefits of switching from a manual to computerized vibration predictive maintenance system, 12:15683 (RA;US)

Cattolica, R.J., Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)

Catton, I., *See* Yeh, H.C., 12:15830

Cavailler, C., Utilisation of image intensifiers used in conjunction with streak cameras, 12:16670 (R;FR;In French)
See Bourgade, J.L., 12:17397

Cazzoli, E., *See* Khatib-Rahbar, M., 12:16004

Cechura, M., Effects of liquid on partially filled tanks - numerical results, 12:16050 (RA;CS;In Czech)

Ceci, R.M., Beyond 1985: New market development, 12:15637 (BA;US)

Cervinsky, J., *See* Pesek, M., 12:16851

Cesta, T., *See* Goodfellow, H.D., 12:16703

Cha, Y.S., *See* Picologlou, B.F., 12:17520

Chadwick, G., *See* Atwood, W.B., 12:16658

Chakraborty, B., *See* Fluss, M.J., 12:16307

Chalabyan, T.S., *See* Akopova, A.B., 12:16607

Chamberlain, H.E., Experimental study of the recovery of plutonium from non-combustible wastes, 12:15429 (R;FR)

Chamberlain, L.R., Synthesis, structure, and spectroscopic properties of early transition metal eta²-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)

Chambre, P.L., Mass transfer of soluble species into backfill and rock, 12:15476 (J;US)
Radionuclide transport through penetrations in nuclear waste containers, 12:15474 (J;US)
See Lee, W.W.L., 12:15475

Chan, S.H., *See* Condiff, D.W., 12:16142

Chan, S.K., Theory of the energetics and nonclassical nucleation for the tetragonal-monoclinic transformation of zirconia, 12:16328 (R;US)
See Nevitt, M.V., 12:16340

Chanan, G.A., Solar flare x-ray polarimetry. Final scientific report, 1 April 1984-30 September 1986, 12:17034 (R;US)

Chandler, G.T., *See* Wicks, G.G., 12:16356

Chang, C., Present status of the SRRC Project, 12:16582 (RA;US)

Chang, J., *See* Khandelwal, P.K., 12:16339

Chang, K.C., *See* Berry, G.F., 12:15326

Chang, S.H., *See* Kim, T.W., 12:16096

Chao, F.C., Startup range neutron monitor period-based transient monitor, 12:15788 (J;US)

Chaplitskaya, T.V., *See* Vishnevskij, V.A., 12:16642

Chapman, C.R., Planetary astronomy, 12:17003 (RA;US)

Chapman, R.O., *See* Gabriel, J.R., 12:17640

Chappell, M.S., Canadian wind energy R & D, 12:15639 (BA;US)

Char, N.L., Presentation of the purpose of the meeting, 12:15876 (RA;XA)

Charbonneau, A.G., Motor-operated valve operability verification and trending from the motor control center, 12:15952 (J;US)

Charl, M.V.K., Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)

Charlassoux, C., *See* Richard, A., 12:16246

Charity, R.J., *See* McMahan, M.A., 12:16650

Charnoff, G., Utility prudency issues, 12:15916 (J;US)

Charpin, P., *See* Livet, J., 12:16428

Charyulu, V.P., *See* Larson, H.A., 12:15933

Chason, M.K., *See* Smedskjaer, L.C., 12:16309, 12:16310

Chattin, J.C., *See* Miller, C.E., 12:15502

Chaudhuri, U.N., Effect of carbon dioxide on sorghum yield, root growth, and water use, 12:16906 (J;NL)

Chaumont, J., *See* Della Mea, G., 12:16349

Chechetkin, V.R., *See* Levchenko, E.B., 12:17355

Chelf, P., *See* Barclay, W., 12:15613

Chen, C.T.A., Carbon dioxide increase in the atmosphere and oceans and possible effects on climate, 12:16739 (J;US)
Carbonate chemistry during WEPOLEX-81, 12:16790 (J;US)
Distributions of dissolved calcium and alkalinity in the Weddell Sea in winter, 12:16932 (J;US)
Excess carbon dioxide in the Weddell Sea, 12:16788 (J;US)
Inhomogeneous distribution of tracers in the abyssal southern ocean, 12:16792 (J;US)
Preliminary observations of oxygen and carbon dioxide of the wintertime Bering Sea marginal ice zone, 12:16787 (J;GB)

Chen, G.L., *See* Owens, T.L., 12:17541

Chen, L.J., *See* Gelbard, E.M., 12:15858

Chen, J.T., *See* Sen, A., 12:16413

Chen, S., *See* Jacobs, M., 12:16212, 12:16214
See Liu, N., 12:16581

Chen, Y., Evaluation of a specific type of filter bag supplied by various vendors, 12:15744 (RA;US)
See Narayan, J., 12:16344

Cheng, E.T., A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries, 12:17540 (J;US)
See Engholm, B.A., 12:17506
See Schultz, K.R., 12:17505
See Sze, D.K., 12:17514, 12:17547
See Wong, C.P.C., 12:17515

Cheng, H.C., A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)

Cheng, K.C., *See* Chang, C., 12:16582

Cheng, M.L., *See* Stock, J., 12:15646

Cheplakov, A.P., γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem, 12:17211 (R;SU)

Chepulis, P., *See* Ed, D., 12:15548

Chernikov, A.N., *See* Kiselev, Yu.F., 12:16672

Chernikov, N.A., Metric nature of spinor field, 12:17175 (R;SU;In Russian)

Chernyshenko, T.A., *See* Dem'yanov, A.V., 12:16512

Chesl, E., *See* Beuttenmuller, R., 12:16660

Chesnes, A.A., Energy savings in transportation: An overview, 12:16215 (BA;US)

Chess, E.K., Analysis of coal and coal liquid combustion products, 12:15330 (RA;US)
See Bean, R.M., 12:16896
See Wright, C.W., 12:15295

Cheung, Y.K., TRACB04 study on suppression pool swelling during containment venting, 12:16092 (J;US)
Chevreau, G., *See* Carre, F., 12:17426
Chexal, B., Correlation for predicting reactor power during a BWR ATWS, 12:16133 (J;US)
Chiang, T.C., *See* Miller, T., 12:16315
Chiappetta, L.M., User's manual for a TEACH computer program for the analysis of turbulent, swirling reacting flow in a research combustor, 12:16499 (R;US)
Chiappini, R., *See* Lameille, J.M., 12:16350
Chikawa, J., *See* Tanaka, J., 12:16505
Childress, P.C., *See* Box, W.D., 12:15800
Chilingaryan, A.A., *See* Akopov, N.Z., 12:16609
Chilton, M.D., *See* Hood, E.E., 12:16803, 12:16804
Chilton, W.S., *See* Hood, E.E., 12:16804
Chin-Fatt, C., *See* Antoniades, J., 12:17457
Ching, W.Y., Theoretical studies of defects in binary and ternary oxides, 12:16329 (R;US)
Chisholm, G.H., An approach to the verification of a fault-tolerant, computer-based reactor safety system: A case study using automated reasoning: Volume 2, Appendixes: Interim report, 12:16028 (R;US)
Toward formal analysis of ultra-reliable computers: A total systems approach, 12:17644 (R;US)
Chitanvis, S.M., A self-similar approach to the explosion of droplets by a high energy laser beam, 12:17386 (R;US)
Chizhov, A.V., *See* Matveev, V.A., 12:17150
Cho, D.H., *See* Condiff, D.W., 12:16142
Cho, J.H., Summary of PWR leak detection studies, 12:16093 (J;US)
Cho, N., Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
Choe, H., *See* Huang, R.L., 12:16077
Choi, H.O., *See* Chun, M.H., 12:16136
Choi, S.H., Space-based laser-driven MHD generator: feasibility study. Final report, 12:16187 (R;US)
Choi, U.S., Measurements of pressure drop in turbulent pipe flows of highly loaded HDPE slurries, 12:16200 (R;US)
Cholewa, M., *See* Lipman, J.J., 12:16884
See Wallwork, J.C., 12:16907
Chopra, O.K., Aging degradation of cast stainless steel, 12:15765 (R;US)
Choudhury, A.K., *See* Kaufman, I., 12:15707
Chrien, R.E., FRC translation into a compression coil, 12:17472 (RA;US)
See Armstrong, W.T., 12:17470
See McKenna, K.F., 12:17474
See Rej, D.J., 12:17469
See Tuszewski, M., 12:17473
Christel, L.A., Silicon solar cells with polysilicon contacts, 12:15612 (R;US)
Christensen, A.B., Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant, 12:15472 (J;US)
Christensen, J.D., Reinspection methods implemented for quality, 12:16109 (J;US)
Christensen, R.N., *See* Jayanti, S., 12:16078
Christensen-Dalsgaard, J., Helioseismology, 12:17046 (R;DK)
Solar oscillations, 12:17044 (R;DK)
Christian, K.L., *See* Hickey, C.R., 12:15515
Christianson, C.C., *See* DeLuca, W.H., 12:16149
See Miller, J.F., 12:16234
Christie, W.H., *See* Abraham, M.M., 12:16343
Christman, D.R., *See* Arnett, C.D., 12:16816
Christoffel, T., Nuclear weapons testing fallout: proving causation for exposure injury, 12:16163 (J;US)
Chu, K.H., Assessment of the heat transfer models in the TRACB02 code, 12:16138 (J;US)
See Cheung, Y.K., 12:16092
Chu, L., *See* Ed, D., 12:15548
Chu, P.S., *See* Baker, R.W., 12:15636
Chu, T., *See* Cho, N., 12:16099
Chu, T.L., New scenario for intersystem LOCAs in BWRs, 12:16098 (J;US)
Chu, T.Y., *See* Dunn, J.C., 12:15630
Chu, W.K., Ion beam channeling in superlattices, 12:16366 (BA;US)
Chubarian, M.Y., *See* Cheplakov, A.P., 12:17211
Chuck, L., *See* Freiman, S.W., 12:16338
Chumakov, S.M., *See* Leznov, A.N., 12:17364
Chun, M.H., Experimental and theoretical investigation of a phase-change front-prediction method, 12:16136 (J;US)
Chung, C.H., *See* Rhee, B.W., 12:16003
Chung, H.M., *See* Chopra, O.K., 12:15765
Chung, P., Monitoring of steam turbine environments for detection of stress corrosion cracking, 12:15694 (RA;US)
Chupp, E.L., Gamma-ray spectrometer experiment on the solar maximum mission satellite. Final report, 16 October 1984-15 April 1986, 12:17041 (R;US)
Chvyrov, A.S., *See* Arkhipov, V.V., 12:17149
Chynoweth, D.P., *See* Srivastava, V., 12:15585
Cialone, H.J., *See* Holbrook, J.H., 12:16242
Cidlinsky, K., Present status of geological and geophysical work at selected nuclear power plant sites in Czechoslovakia, 12:15966 (RA;CS;In Czech)
Ciesiolka, J., *See* Casser, E., 12:16153
Claar, T.D., *See* Ackerman, J.P., 12:16197
Clapp, D.E., Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon, 12:16713 (R;US)
Clark, J.A., Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Clark, S.R., *See* Hearst, J.R., 12:15348
Clarkson, I.R., *See* Luzzi, T.E., 12:17555
Claro, F., *See* Rojas, R., 12:17358
Clauer, A.H., *See* Wright, I.G., 12:15290
Claybrook, S.W., *See* Waldo, J.B., 12:16079
Clayton, C.R., *See* Diegle, R.B., 12:16296
Clayton, J.C., In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)
Cleland, R.E., *See* Gabathuler, R., 12:16808
Clements, W., *See* Cabayan, H.S., 12:17488
Cleveland, W.E., Mechanitrack system, 12:15697 (RA;US)
Clinard, F.W. Jr., Ceramics for fusion devices, 12:17629 (BA;US)
Cobble, J.A., *See* Hillis, D.L., 12:17415
Coburn, J.B., *See* Allen, C.C., 12:16723
Cochran, W.D., *See* Smith, H.J., 12:16988
Coerdt, W., Analytical instruments at the Institute of Radiochemistry, 12:16430 (R;DE;In German)
Coffey, H.E., Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
Cohen, J.J., Approach to defining de minimis, intermediate, and other classes of radioactive waste, 12:15459 (J;US)
Cost effectiveness for improved methods of low-level radioactive waste disposal, 12:15463 (J;US)
See Wickham, L.E., 12:15465
Cohen-Tannoudji, G., *See* Baton, J.P., 12:17128
Cohn, D.R., Super high field ohmically heated tokamak operation, 12:17543 (J;US)
Colt, R.L., *See* Aschoff, A.F., 12:15720
Colburn, R.P., *See* Lutton, J.M., 12:15852
Colcher, D., *See* Brechbiel, M.W., 12:16841
Cole, C.R., Evaluation and status report on HYDROCOIN at midway (HYDROCOIN: An international project for studying groundwater hydrology modelling strategies), 12:16920 (R;US)
Cole, L.W., Analysis of uranium and thorium contaminated soils during a cleanup and interment operation, 12:15550 (RA;US)
Health physics experience during a uranium and thorium pond closure, 12:15500 (RA;US)
Cole, W.C., *See* De Nardo, G.L., 12:16820
Coleman, D.J., *See* Lipeles, R.A., 12:16347
Coleman, G.N., New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Colestock, P., *See* Sheffield, J., 12:17492
Collings, E.W., *See* Holbrook, J.H., 12:16242
Collins, E.D., *See* Holladay, D.W., 12:15534
See Mailen, J.C., 12:15441
See McGinnis, C.P., 12:15485
Collins, J.C., *See* Berger, E.L., 12:17124
Colowick, S., *See* Lipman, J.J., 12:16884

Colt, R.L., Condenser performance improvements, 12:15717 (RA;US)
Combi, M.R., *See* Smyth, W.H., 12:17031
Combis, P., Absorption of aluminium X-ray lines in a laser created gold plasma, 12:17398 (R;FR)
Comes, S.A., Examination of fuel reinsertion strategies for out-of core fuel management, 12:15907 (J;US)
Comfort, R.H., Space plasma research. Final report, August 1980-August 1986, 12:17413 (R;US)
Condiff, D.W., Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Conforto, G., Quarkonia, 12:17111 (RA;CS)
Congel, F.J., *See* Branagan, E.F. Jr., 12:15540
Conjeaud, M., *See* Cassagnou, Y., 12:17240
See Mostefai, M., 12:17241
Conley, E.F., *See* Impagliazzo, A.M., 12:15715
Conn, R.W., *See* Ghoniem, N.M., 12:17533
See Kulcinski, G.L., 12:17625
Connick, B.J., Evaluation and use of iron dispersants in the Con Edison System, 12:15723 (RA;US)
Connolly, J.S., *See* Hurst, J.K., 12:16425
Constant, M., *See* Eymery, R.P., 12:15395
Conway, T.J., *See* Komhyr, W.D., 12:16762
Cook, B.A., Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
Cook, D.L., New England solar energy atlas, 12:15596 (R;US)
Cook, D.N., *See* Zhu, Y.S., 12:16796
Cook, K.V., Flaw density examinations of a clad boiling water reactor pressure vessel segment, 12:15763 (R;US)
Coons, D.E., Facile reductive cleavage of the C=O bond of acyl halides and the C identical with N bond of nitriles by hydrogen in the presence of sulfido-bridged molybdenum complexes, 12:16415 (J;US)
Cooper, R.H. Jr., *See* Hoffman, E.E., 12:15868
Copenhaver, C., *See* Miller, R.L., 12:17502
Copenhaver, E.D., Training requirements for health physicists in the decontamination/decommissioning field, 12:15536 (RA;US)
Corley, J.P., *See* Kennedy, W.E. Jr., 12:15443
Cornille, H., New exact inhomogeneous solutions of the Boltzmann equations, 12:17059 (R;FR)
Corradini, M.L., *See* Pong, L.C., 12:16140, 12:16143
See Sviatoslavsky, I.N., 12:17511
Corse, E.W., *See* Edney, E.O., 12:16718
Cosma, G.N., *See* Marchok, A.C., 12:16895
Cossairt, J.D., Shielding design at Fermilab: Calculations and measurements, 12:16549 (R;US)
See Elwyn, A.J., 12:16517
Costantino, C.J., *See* Philippacopoulos, A.J., 12:16005
Costello, K.W., Economic challenges facing rural electric cooperatives, 12:16171 (R;US)
Cotter, S.J., *See* Miller, C.W., 12:15505
Coudeville, A., *See* Andre, M., 12:17430
Coughlan, S.J., Thylakoid phosphoproteins, 12:15598 (R;US)
Courouble, J.M., *See* Auchapt, P., 12:15379
Courtney, L.H., *See* Riedinger, L.L., 12:17235
Cowen, J.A., Magnetic phase transitions in nanocrystalline erbium, 12:16255 (R;US)
Cowherd, C. Jr., Identification, assessment, and control of fugitive particulate emissions, 12:16702 (RA;US)
Cowley, P.J., Managing the data analysis process, 12:17656 (R;US)
Cowley, S.W.H., *See* Sanderson, T.R., 12:16966
Cox, A.N., Pulsations of white dwarf stars with thick hydrogen or helium surface layers, 12:16963 (R;US)
See Cahn, J.H., 12:16965
See Ostlie, D.A., 12:16964
Cox, B., Heavy flavors, 12:17155 (R;US)
Cox, D.E., *See* Torardi, C.C., 12:16335
Coy, D.W., *See* Goodfellow, H.D., 12:16703
Coyne, J.J., *See* Wilson, W.E., 12:17324
Cramer, J.G., *See* Lu, J.Q., 12:16522
Crane, C.D. III, Interactive animated displayed of man-controlled and autonomous robots, 12:16459 (J;US)
Craun, J.C., *See* Gray, R.H., 12:15340
Crawford, E.A., *See* Hoffman, A.L., 12:17464
Crawley, H.B., *See* Breakstone, A., 12:17121
Creedon, R.L., *See* Wong, C.P.C., 12:17515
Crellin, G.L., Looking out for common cause failures, 12:15919 (J;US)
Croff, A.G., *See* Kocher, D.C., 12:15458
Croft, M., Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)
Crone, A., *See* Karaffa, M., 12:16716
Cross, F.T., *See* Denham, D.H., 12:15442
Crotty, J.M., *See* Richter, G.N., 12:15288
Crouse, D.J., *See* McGowan, C.W., 12:15374
Crouse, J.C., *See* Rackliffe, G.B., 12:15666
Crow, K.R., Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)
Crowe, C.T., *See* Hanjalic, K., 12:15296
Crowe, K.M., *See* Breunlich, W.H., 12:17207
Crowley, J.H., Concept of prudence and its impact, 12:16180 (J;US)
Cruikshank, D.P., *See* Hall, D.N.B., 12:16976
Csom, G., *See* Levai, F., 12:15992
Csorna, S., *See* Atwood, W.B., 12:16658
Cuddihy, E.F., The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)
See Koenig, J.L., 12:15604
Cuffiani, M., *See* Breakstone, A., 12:17121
Culbertson, R.J., *See* Pennycook, S.J., 12:16364
Cull, T.A., General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)
Cummings, F.M., *See* Faust, L.G., 12:16875
See Roberson, P.L., 12:16877
Curelaru, I., *See* Tsang, K.L., 12:16293
Curl, R.F., *See* Heath, J.R., 12:16424
Curran, R.P., San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Cuvellier, J., *See* Mestdagh, J.M., 12:17063
Cybulski, D.S., Summary of safety relief valve position indication systems, 12:16119 (J;US)
Czerski, K., *See* Rondio, J., 12:17221
Czirr, J.B., *See* Thome, R.J., 12:17550

D

D'Amico, A., *See* Metting, N.F., 12:16868
D'Ettorre Piazzoli, B., *See* Ayres, D.S., 12:17094
da Roza, R.A., Powered air-purifying respirator study: Final report, 12:16915 (R;US)
Dabiri, A.E., Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17486 (R;US)
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17538 (J;US)
Dacunhalima, I.C., *See* Deandradaesilva, E.A., 12:16359
Dahl, A.R., Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)
See Bond, J.A., 12:16890
Dahlman, R.C., Modeling needs for predicting responses to CO_2 enrichment: plants, communities and ecosystems, 12:16763 (J;NL)
Dake, L.S., *See* Baer, D.R., 12:16294
Dalder, E.N., *See* Gurol, H., 12:17607
Dalessandro, J.A., *See* Bogart, S.L., 12:17586
Daling, P.M., *See* Schneider, K.J., 12:15466
Dallal, D.M., *See* Schlanger, E.H., 12:16447
Dallas, J., *See* Adams, D., 12:16823
Dallinger, R.F., *See* Hopkins, M.D., 12:16410
Dalmas, J., *See* Augustyniak, W., 12:17228
Dalton, J.T., *See* Chamberlain, H.E., 12:15429
Daly, P.W., *See* Sanderson, T.R., 12:16966
Danagulyan, S.S., Calculation and modelling of electron channel with a beam small angular divergence, 12:16544 (R;SU;In Russian)
Daneu, Electron-pumped high-efficiency semiconductor laser, 12:16462 (R;US)
Danevich, F.A., *See* Bondarenko, O.A., 12:16643
Daniel, B.E., *See* Mosley, R.B., 12:15741
Daniel, H., *See* Breunlich, W.H., 12:17207
Daniels, E., *See* Minkov, V., 12:16188
Danielson, A.H., Nuclear fuel lease accounting, 12:15567 (J;US)
Dankovic, D.A., Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Darden, C., Participation in the ARGUS experiment at the DORIS Collider at Desy, Hamburg, Germany and participation in the AMY experiment at the TRISTAN Collider in Tsukuba, Japan: 1986 progress report, 12:17099 (R;US)
Darroch, I.D., Sharing of benefits and risks in regard to the establishment of nuclear power programmes in

developing countries, 12:15890 (RA;XA)
Darvish, A.R., *See* Kniazewycz, B.G., 12:16457
Daughtry, J.W., *See* Campbell, L.R., 12:15861
Dautray, R., *See* Andre, M., 12:17430
Dauzvardis, P.V., *See* Picologlou, B.F., 12:17522
See Reed, C.B., 12:17518
David, M., Present state of earthquake resistance calculations for the main generating units of nuclear power plants Mochovce and Temelin, 12:16040 (RA;CS;In Czech)
Davidson, E.S., *See* Abraham, S.G., 12:17667
Davidson, M.J., On-line boiler stress and condition analyzer, 12:15702 (RA;US)
Davis, D.R., *See* Chapman, C.R., 12:17003
Davis, H.A., Observation of high-power microwave emission from a virtual cathode device, 12:16497 (BA;US)
Davis, J.P., Evaluation of the potential for deregulated disposal of very low level wastes from nuclear power plants, 12:15455 (J;US)
Davis, P.B., On the mutagenicity of fly ash samples from the PGEM power plant 'Gelderland' at Nijmegen, as determined with the Ames test, 12:15319 (R;NL;DU)
Davis, R., *See* Khatib-Rahbar, M., 12:16004
Davis, W.A., *See* Hillis, D.L., 12:17415
Dawson, L.R., Superlattice structures grown by molecular beam epitaxy, 12:16371 (BA;US)
Dawson, R.K., *See* Chamberlain, H.E., 12:15429
Daymon, D., *See* Shikiya, J., 12:16714
Dayras, R., Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
See Cassagnou, Y., 12:17240
De Bievre, P., ^{235}Uranium isotope abundance certified reference material for gamma spectrometry EC nuclear reference material 171 certification report, 12:16389 (R;FR)
De Nardo, G., *See* Adams, D., 12:16823
De Nardo, G.L., Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
See Macey, D.J., 12:16819
De Nardo, S., *See* Adams, D., 12:16823
De Nardo, S.J., *See* De Nardo, G.L., 12:16820
See Macey, D.J., 12:16819
de Planque, G., *See* Beck, H.L., 12:17335
de Saussure, G., *See* Goldstein, M., 12:16440
de Vore, L., *See* Cabayan, H.S., 12:17488
de Wit, B., Supergravity: The basic and beyond, 12:17394 (BA;US)
Deal, J.B., *See* Barnes, N.P., 12:16471
Dean, A., System for automatic monitoring of longwall supports at Angus Place colliery, 12:15321 (R;AU)
Deandradaesilva, E.A., Density of states due to pairing of impurities in semiconductor systems, 12:16359 (R;BR)
DeAngelis, D., *See* Koppe, R.H., 12:15770
Dearborn, D.S.P., *See* Blake, J.B., 12:16935, 12:16938
Decho, A.W., Feeding relationships of harpacticoid copepods and microbial flora in a salt marsh, 12:16827 (RA;US)
Dedenko, L.G., *See* Gusev, G.A., 12:17057
Deen, J.R., Preliminary LEU fuel cycle analyses for the Belgian BR2 reactor, 12:15981 (R;US)
Dees, D.W., Characterization of monolithic fuel cell components, 12:16191 (R;US)
DeFrancesco, S.J., *See* Godfrey, P.J., 12:16783
DeGloria, D.P., *See* Daneu, 12:16462
Degtyarenko, P.V., *See* Bayukov, Yu.D., 12:17238
Deinzer, W., Self-consistent models of solar photospheric magnetic flux concentrations, 12:16947 (RA;CS)
Dej, Yu.A., *See* Vishnevskij, V.A., 12:16642
Del Moral, R., *See* Hubert, F., 12:17217
Del Vecchio, R.M., *See* Holland, J.R., 12:17491
Delagrange, H., Particle emission but also fission in the decay of very excited nuclei, 12:17260 (R;FR)
See Ardouin, D., 12:17219
See Bimbot, R., 12:16559
Delapalme, A., *See* Lander, G.H., 12:16313
DeLaurentis, J.M., *See* Boughton, B.A., 12:16679
Della Mea, G., Hydrogen doping of silica by ion beam enhanced hydration, 12:16349 (R;FR)
Della Negra, S., *See* Becker, O., 12:17080
See Bimbot, R., 12:16559
Delong, A., Electron and ion beams in surface investigation of solids, 12:17345 (RA;CS)
DeLuca, W.H., Temperature effects on nickel/iron battery characteristics, 12:16149 (R;US)
Delzer, D.B., *See* McDaniel, E.W., 12:15414
Dem'yanov, A.V., Influence of the crater at the target surface on the ion outflow from laser produced plasma, 12:16562 (R;SU;In Russian)
Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)
Demasi, J.T., Thermal barrier coating life prediction model development. Annual report, 12:16332 (R;US)
Dembo, M., Cell motion, contractile networks, and the physics of interpenetrating reactive flow, 12:16801 (J;US)
Numerical studies of unreactive contractile networks, 12:16802 (J;US)
Demchenko, V., *See* Tajima, T., 12:17401
deMelo, J., SK-banyans: A unified class of banyan networks, 12:17671 (BA;US)
Demin, V.F., *See* Legasov, V.A., 12:15870
Deming, D., Spectroscopic planetary detection, 12:17019 (RA;US)
See Mumma, M.J., 12:16971
Deming, E.J., Radiological field survey problems & solutions, 12:15526 (RA;US)
See Murphy, G.L., 12:15552
Den Hartog, P., ATLAS accelerator laboratory report, 12:16508 (R;US)
Dendahl, K.H., Determination of U-238, Ra-226, and Th-232 by gamma-ray spectrometry in unprocessed soil samples, 12:15524 (RA;US)
Denham, D.H., Technical assistance to Department of Energy/Office of Operational Safety Assurance Program for remedial action, 12:15442 (RA;US)
See Stenner, R.D., 12:15557
Deninno, M.M., *See* Breakstone, A., 12:17121
Denisov, D.S., Rectangular drift tube characteristics, 12:16617 (R;SU)
Dennis, C., *See* Minkov, V., 12:16188
Depiente, E., *See* Hansen, K.F., 12:15928
Derkin, B.V., *See* Anriashin, A.V., 12:16627
Dermer, C.D., Neutron and antineutron production in accretion onto compact objects, 12:17042 (R;US)
DeRoos, F.L., *See* Howes, J.E., 12:16715
Deruytter, A.J., *See* Schillebeeckx, P., 12:17247
DeSain, G., *See* Headley-Walker, L., 12:15940
DeSalvo, R., *See* Amos, N., 12:16657
Deshpande, S.M., On the Maxwellian distribution, symmetric form, and entropy conservation for the Euler equations, 12:16476 (R;US)
Destot, M., Training on Siloette reactor and associated simulators at the Grenoble Nuclear Research Centre, 12:15993 (RA;XA)
Detwiler, R.P., *See* Hall, C.A.S., 12:16765
Deutch, L., *See* O'Brien, D.A., 12:17600
See Steiner, D., 12:17516
Deutsch, L., *See* Embrechts, M.J., 12:17594
Devkin, B.V., *See* Lychagin, A.A., 12:17213
DeVolpi, A., Accidental-coincidence corrections, 12:16667 (J;US)
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)
See Markoff, D., 12:16121
DeVore, J.R., Remote methods for decontamination and decommissioning operations, 12:15520 (RA;US)
Devoto, R.S., *See* Henning, C.D., 12:17499
DeZubay, E.A., *See* Bachovchin, D.M., 12:15276
Di Bona, G., *See* Babonneau, D., 12:17431
Diamond, D.J., Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Diamond, P.H., *See* An, Z.G., 12:17483
Diamond, R.C., Ventilation and occupant behavior in two apartment buildings, 12:16203 (R;US)
Diaz, H.F., *See* Bradley, R.S., 12:16693
Diaz de la Rubia, T., *See* Averback, R.S., 12:16259
Dick, J.J., Short pulse initiation of detonation in a TATB explosive, 12:16680 (BA;US)
Dickes, J.M., *See* Metting, N.F., 12:16868
Dickinson, R.J., *See* Menlove, H.O., 12:16647
Dickman, P.T., *See* Atwood, C.L., 12:17330
Didenko, L.A., *See* Baldin, A.M., 12:17201

Diebold, R., Extending the reach of the SSC [Superconducting Super Collider], 12:16503 (R;US)
Diegle, R.B., Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)
See Sorensen, N.R., 12:16297
Dierks, R.D., *See* Holton, L.K. Jr., 12:15478
Dietze, G., Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils, 12:16775 (R;DE;In German)
Diggs, R.S., *See* Curran, R.P., 12:15685
Ding, F., *See* Hahn, H., 12:16249
Dingus, R.S., Plasma energy balance model for optical-laser-induced impulse in vacuo, 12:16466 (R;US)
Dinh Sy Hien, Analog-to-digital converter, 12:16631 (R;SU;In Russian)
Dinsel, M.R., *See* Phelps, R.L. Jr., 12:15821
DiPeso, G.J., Simulation of the Berkeley research reactor using DSNP, 12:15998 (J;US)
Distenfeld, C.H., Composite empirical and analytical method to predict the magnitude of surface contamination in semi-accessible areas, 12:15506 (RA;US)
Fast sorting measurement technique to determine decontamination priority, 12:16013 (RA;US)
Ditmars, J.D., *See* Paddock, R.A., 12:16237
Dittmar, L.A., Can nuclear power survive rate-of-return regulation?, 12:16178 (J;US)
Divona, C.J., *See* Heckendorn, F.M., 12:15481
Dixon, R.D., The influence of a plasma during laser welding, 12:16473 (BA;US)
Dobbe, C.A., *See* Adams, J.P., 12:16026
Dobbs, G.M., *See* Eckbreth, A.C., 12:16434
Dobes, J., *See* Betak, E., 12:17273
Dodd, R.A., *See* Garner, F.A., 12:16277
Dodge, C.J., *See* Krishna, C.R., 12:15269
Dodson, K.E., *See* Tallent, O.K., 12:15469
Doerner, R.C., *See* Devolpi, A., 12:16014
Doggett, J.N., *See* Henning, C.D., 12:17499
See Nelson, W.D., 12:17501
Doherty, A.L., *See* Libby, R.A., 12:16449
Doizi, D., Bibliographic study of photophysical and photochemical properties of laser dyes, 12:16465 (R;FR;In French)
Dolan, T.J., *See* Kunze, J.F., 12:17537
Dolenc, M.R., Idaho National Engineering Laboratory release criteria for decontamination and decommissioning, 12:15551 (RA;US)
Domagala, R.F., Phases in U-Si alloys, 12:16256 (R;US)
Domoto, K., Development of a PCMI analysis code for the Fugen MOX fuel rod, 12:15845 (BA;US)
Donahoe, R.J., 1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)
Donaldson, T.L., Recovery of methane from combined industrial and municipal wastewater by anaerobic treatment, 12:15586 (R;US)
Donn, B., *See* Brandt, J.C., 12:16999
Dooley, B., EPRI fossil plant cycle chemistry programs, 12:15724 (RA;US)
Dooley, M.A., *See* Vesper, B.E., 12:15521, 12:15528
Dooley, R.B., *See* Aschoff, A.F., 12:15720
Dooling, J.C., Nd:Glass lasers for Thomson scattering plasma diagnostics on the compact toroid transport experiment, 12:17422 (BA;US)
Dormeval, R., Ductility of materials under dynamic solicitations, 12:16243 (R;FR;In French and English)
Dory, R.A., *See* Sheffield, J., 12:17492
Doss, E.D., Advanced research in instrumentation and control technology: Multiphase flow studies, 12:15323 (R;US)
Dostal, L., *See* Pivarc, J., 12:16509
Doster, J.M., *See* Holliday, M.R., 12:17579
See Sills, E.D., 12:15789
Doubre, H., *See* Ardouin, D., 12:17219
Doucette, W.J., *See* Sims, R.C., 12:16221, 12:16222
Doughty, M.W., *See* Yashan, D., 12:16295
Douglas, I., *See* Menlove, H.O., 12:16647
Downing, R.A., *See* Gale, I.N., 12:15626
Doyle, J.F. III, Role of the Federal Radiological Monitoring and Assessment Center (FRMAC) following a radiological accident, 12:16914 (R;US)
Doyle, R.D., Operating a transportable volume reduction and solidification system (TVR-III), 12:15468 (J;US)
Drabek, P., *See* Klatil, J., 12:16049
Drake, E.T., *See* Chen, C.T.A., 12:16739
Drake, J., PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)
Dran, J.C., *See* Della Mea, G., 12:16349
Dranenko, V.V., *See* Solyany, V.I., 12:15797
Draper, J.V., Manipulator comparative testing program, 12:16453 (J;US)
See Fujita, Y., 12:16452
Draugis, E.J., *See* Holbrook, J.H., 12:16242
Draulans, J., Survey of existing literature in the field of shock-absorbing materials with a view to subsequent adaptation of plastic deformation codes. Phase 1, 12:16442 (R;FR)
Drell, P., *See* Alexander, J., 12:16659
Dresselhaus, M.S., *See* Steinbeck, J., 12:17352
Drewett, G.M., Hazardous-waste management: a descriptive study. Master's thesis, 12:16156 (R;US)
Driemeyer, D.E., *See* Waganer, L.M., 12:17621
See Zuckerman, D.S., 12:17620
Droppo, J.G., Hanford 67-series: atmospheric field-diffusion measurements, micrometeorological and tracer data archive, Set 003 documentation report. Interim report, 12:16719 (R;US)
Drouin, M.T., Summary of core damage frequency from internal initiators: Grand Gulf, 12:16084 (J;US)
Drozd, A., *See* Baron, J., 12:16103
See Maneke, J.L., 12:16108
Drozdov, V.A., *See* Butenko, V.A., 12:16630
Drucker, H., Illinois biotechnology resources: An overview, 12:15601 (R;US)
See Gray, R.H., 12:15340
Drummond, J.D., Speckle interferometry applied to asteroids and other solar system objects, 12:17004 (RA;US)
Du, P.C., Continuous mixture computational algorithm of reservoir fluid phase behavior applicable for compositional reservoir simulation, 12:15364 (BA;US)
Du Xiangwan, On mechanisms of reaction /sup 9/Be(n,2n), 12:17280 (RA;CS)
Dubinin, A.A., *See* Bezhunov, G.M., 12:17309
DuBois, D.L., Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
DuBois, M.R., *See* Coons, D.E., 12:16415
DuBois, R.D., Multiple target ionization by proton impact, 12:17319 (RA;US)
Structured ion impact: double differential cross sections, 12:17316 (RA;US)
Total ion and electron yields, 12:17318 (RA;US)
See Toburen, L.H., 12:17314
Duchacek, V., Detection of radiation processing in onions, 12:16848 (RA;CS;In Czech)
Dudley, A.L., *See* Peters, R.R., 12:15438
Dudley, L.M., *See* McLean, J.E., 12:16776
Dudziak, D.J., Heavy-ion fusion: Future promise and future directions, 12:17588 (J;US)
See Pendergrass, J.H., 12:17563
Dueren, R., Asymmetric scattering in thermal collisions of alkali (/sup 2/P/sub 3/2/)-atoms with rare gas atoms: Na(3/sup 2/P/sub 3/2/) and K(4/sup 2/P/sub 3/2/) with Ne, Ar and Kr, 12:17079 (RA;CS)
Duffey, D., University papers in American Nuclear Society (ANS) transactions with enrollment and degrees-III, 12:15941 (J;US)
Duffy, J., *See* Crane, C.D. III, 12:16459
Duffy, K.T., *See* Lamb, G.E.R., 12:15738
Dufour, J.P., *See* Hubert, F., 12:17217
Dugan, E.T., *See* Welch, G.E., 12:15831
Dugan, R.C., *See* Burrage, L.M., 12:15668
Duggan, W.P., Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor, 12:17498 (J;US)
Duka-Zolyomi, A., *See* Kliman, J., 12:17250
Dukler, M.S., *See* Salomon, J.H., 12:15691
Duncan, A., *See* Wade, J.E., 12:15640
Duncan, D., *See* Sioshansi, P., 12:15704
Duncan, R.A., *See* McClendon, R.E., 12:15643
Dunham, E.W., *See* Elliot, J.L., 12:16974
Dunker, H., *See* Becker, M., 12:15618
Dunlop, A., *See* Auvray-Gely, M.H., 12:16326
Dunn, J.C., Magma energy extraction, 12:15630 (R;US)
Dunn-Rankin, D., A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)

Dunstan, G., *See* Kharkar, D.P., 12:15539
Duplessy, J.-C., Ice ages, 12:16917 (RA;CS)
Dural, J., Interaction of GeV heavy ions with solids-first results at GANIL, 12:16536 (R;FR)
Durant, W.S., Hot canyon crane operating problems and equipment failures: F-Canyon Reprocessing Facility, Savannah River Plant, 12:15386 (R;US)
Durfee, L.D., *See* Chamberlain, L.R., 12:16409
Durham, D.L., Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
Durling, B.J., *See* Anderson, M.S., 12:16444
Dutta, J.M., Plasma diagnostics: Detection of laser scattering: Final report, September 1, 1978 to August 31, 1982, 12:17400 (R;US)
Duvick, D.N., *See* Blasing, T.J., 12:16689
Dvurecenskij, A., Joint distributions of observables and measures with infinite values, 12:17376 (R;SU)
Dziuk, T.W., *See* Rao, C.D., 12:15511

E

Eartly, D., *See* Amos, N., 12:16657
Eastman, C.M., Organization and management of heterogeneous, dispersed data bases in nuclear engineering, 12:15917 (J;US)
Eberle, S.H., Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid, 12:16404 (R;DE;In German)
Ebert, W.L., The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
Eckbreth, A.C., Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)
Eckerman, K.F., *See* Gilbert, T.L., 12:15494
Ed, D., Decontamination and decommissioning of a luminous dial painting facility: radiological characterization, segregation and disposal of building materials, 12:15548 (RA;US)
Eddleman, J., *See* Hartman, C.W., 12:17482
Eder, B.K., Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Ederer, D.L., *See* Tsang, K.L., 12:16293, 12:17353
Edlund, M.C., Fast neutron fluxes in pressure vessels using Monte Carlo methods, 12:15822 (J;US)
Edmonds, J., *See* Reilly, J., 12:16701
Edmonds, J.A., IEA/ORAU long-term global energy-CO_2 model, 12:16700 (R;US)
Edney, E.O., Hydroxyl-radical rate-constant intercomparison study. Final report, 12:16718 (R;US)
Edwards, H.T., The tevatron energy doubler: A superconducting accelerator, 12:16519 (BA;US)
Edwards, M., *See* Lempicki, A., 12:16472
Efremenko, V.I., *See* Asratyan, A.E., 12:17114, 12:17115
Efremenko, Yu.V., *See* Bayukov, Yu.D., 12:17238
Ehlbakyan, E.G., *See* Arutyunyan, V.N., 12:16546
Ehlers, K.W., *See* Stevens, R.R. Jr., 12:16563
Ehrenberg, J., Surface analysis of a central part of the JET graphite limiter, 12:17435 (R;DE)
Ehrhardt, F.J., Application of embedded training in nuclear power plant control rooms, 12:16071 (J;US)
Ehrlich, K., European effort on materials, 12:16244 (R;FR)
Ehst, D.A., *See* Baker, C.C., 12:17496
See Finn, P.A., 12:17539
Einziger, R.E., Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
El-Guebaly, L.A., A thin LiPb/Be helium cooled blanket for MINIMARS: Neutronics analysis, 12:17596 (J;US)
See Sviatoslavsky, I.N., 12:17511
Elfruth, T., Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)
Elia, F.A. Jr., *See* Cho, J.H., 12:16093
Elimar, R., *See* Singh, G., 12:15819
Elizarov, O.I., Measuring module of an apparatus for polarization analysis of ultracold neutrons on the base of microcomputer, 12:16639 (R;SU;In Russian)
Ellingson, W.A., *See* Ackerman, J.L., 12:16327
Elliot, J.L., Portable high speed photometry systems for observing occultations, 12:16974 (RA;US)
Elliott, W.P., *See* Fraser, P.J., 12:16745
Ellis, D.E., *See* Ching, W.Y., 12:16329
Ellis, R. Jr., Recent progress of S-1 experiments, 12:17439 (RA;US)
Ellison, J.A., *See* Chu, W.K., 12:16366
Elwyn, A.J., Study of neutron leakage through an Fe shield at an accelerator, 12:16517 (J;US)
Elzinga, M., Carboxyl group reactivity in actin, 12:16794 (R;US)
Embrechts, M.J., Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
See Duggan, W.P., 12:17498
See O'Brien, D.A., 12:17600
See Steiner, D., 12:17516
Emerson, J.E., *See* Fenske, G.R., 12:15849
Emge, T.J., *See* Whangbo, M., 12:16412
Emswiler, T.R., *See* Murphy, G.L., 12:15552
Encrenaz, T., *See* Knacke, R.F., 12:17026
Enderlein, H., Posting in/out technique in KfK hot cells, 12:16461 (J;US)
Endres, G.W.R., *See* Faust, L.G., 12:16875
See Swinth, K.L., 12:16876
Eng, J., Decision making during radiological designation surveys, 12:15496 (RA;US)
Measurement of radon and radon progeny in radium contaminated residential properties in New Jersey, 12:15527 (RA;US)
See White, D., 12:15546
Engelhardt, A.G., *See* Miller, R.L., 12:17502
Engelmann, J.J., Heavy element compositions and energy spectra of galactic and solar cosmic rays, 12:16940 (R;FR;In French)
Engholm, B.A., Radioisotope production in fusion reactors, 12:17506 (J;US)
See Schultz, K.R., 12:17505
Engi, D., A numerical signal processing technique for borehole seismic fracture diagnostics, 12:15367 (R;US)
Engstrom, S., Wind energy activities in Sweden, 12:15638 (BA;US)
Ensor, D.S., Aerosol deposition in fabric filters, 12:15746 (RA;US)
See Yamamoto, T., 12:15740
Enssling, N., Status of in-plant neutron coincidence counting, 12:16663 (J;US)
Enting, E.G., Use of observations in calibrating and validating carbon cycle models, 12:16755 (BA;US)
Erben, O., In core measurement and monitoring of reactor (neutron) radiation field, 12:16624 (RA;CS;In Czech)
Erdoes, G., *See* Benko, G., 12:16962
Eregin, V.E., Calculation of strain-stressed state of the tyre system of superconducting dipole magnets, 12:16568 (R;SU;In Russian)
Eremin, A.V., Electrostatic separator of total fusion reaction products in the heavy ion beam of Vasilisa installation, 12:16640 (R;SU;In Russian)
Ergakov, V.A., *See* Aref'ev, A.S., 12:17197
Erickson, D.G., *See* Meriwether, G.H., 12:15841
Erickson, G., *See* Imai, M., 12:15832
Erickson, K., *See* Adams, D., 12:16823
Eritsyan, G.N., *See* Atabekyan, R.R., 12:17344
Erkkila, B.H., Automated nuclear storage facility, 12:15404 (J;US)
Ermushev, A.V., Construction of finite N=1 supersymmetric Yang-Mills theories, 12:17159 (R;SU)
Ernst, D.J., Dispersive effects in low energy pion-nucleus scattering, 12:17301 (J;NL)
Ernst, M.C., *See* Ohki, K., 12:16806
Ernwein, J., *See* Ayres, D.S., 12:17094
Erzgraeber, G., Three methods to determine the yields of DNA double-strand breaks, 12:16858 (R;SU)
Eschbach, H.L., *See* Berthelot, C., 12:16386
See De Bievre, P., 12:16389
Escher, A., Degradation of ortho phenol by streptomycetes in continuous cultures, 12:16828 (RA;US)
Eskenazi, D., Evaluation of international photovoltaic projects: Volume 1, Executive summary, 12:15616 (R;US)
Espenak, F., *See* Deming, D., 12:17019
See Mumma, M.J., 12:16971
Esteban, J., *See* Brechbiel, M.W., 12:16841
Estill, W.B., Porosity decrease in laser welds of stainless steel using plasma control, 12:16322 (BA;US)
Etter, S.D., *See* Rao, C.D., 12:15511
Ettlinger, L., *See* Seth, S., 12:16100
Evans, C.D., *See* Hamilton, D.R., 12:16861

Evans, E.G., *See* Rhodes, R.C., 12:16720
Evans, K. Jr., *See* Baker, C.C., 12:17496
Ewald, R.H., An overview of computing at Los Alamos, 12:17678 (BA;US)
Exarhos, G.J., High temperature Raman studies of phase transitions in thin film dielectrics, 12:16367 (J;US)
Exkstein, P., Intense neutron generator project at the Technical University Dresden, 12:16557 (RA;CS)
Eymery, R.P., Remote maintenance in the TOR fast reactor fuel reprocessing facility, 12:15395 (J;US)
Ezoyan, R.K., *See* Atabekyan, R.R., 12:17344

F

Fabjan, C.W., *See* Beuttenmuller, R., 12:16660
Fabry, J.P., *See* Draulans, J., 12:16442
Fahley, J.M., PC-based flux mapping data collection system, 12:15829 (J;US)
Fakonas, A.D., Prudence reviews, with hindsight, 12:15912 (J;US)
Faltens, A., *See* Hovingh, J., 12:17616
Famiglietti, M., Leak detection by acoustic emission monitoring in power plant high pressure preheaters, 12:15700 (RA;US)
Fannin, K.F., *See* Srivastava, V., 12:15585
Fanwick, P.E., *See* Chamberlain, L.R., 12:16409
Farahat, M.K., *See* Johnson, I., 12:15965
Farlow, G.C., Use of ion channeling axial scans in the study of ion-implanted Al_2O_3, 12:16341 (J;US)
Farmer, A.J., *See* Holladay, D.W., 12:15534
Farnstrom, K.A., *See* Walker, K.L., 12:15482
Farrow, R.L., High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Faruki, C.J., Planning for rate base treatment of large power plants, 12:16179 (J;US)
Fatemi, S.M., *See* Riley, J.T., 12:15325
Fattgh, A., *See* Menlove, H.O., 12:16647
Faugeras, P., Marcoule pilot plant, 12:15380 (R;FR)
Faust, L.G., Personnel neutron dosimeter evaluation and upgrade program, 12:16875 (RA;US)
Fazal, B., *See* Campbell, K., 12:15564
Fazio, G.G., Space infrared telescope facility wide field and diffraction limited array camera (IRAC). Semiannual status report, 1 March-31 August 1986, 12:16673 (R;US)
Fealey, J., *See* Chari, M.V.K., 12:15706
Fearing, H.A., Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Fecht, B.A., *See* Schneider, K.J., 12:15466
Fedotov, A.V., *See* Asratyan, A.E., 12:17114, 12:17115
Fehrenbach, P.J., *See* Sills, H.E., 12:16022
Feigelson, E.D., *See* Isobe, T., 12:17039
Feldman, E.E., *See* Lee, M.J., 12:15980
Feldman, J., Site clean-up requirements: where does one dispose of dirt?, 12:15537 (RA;US)
See Jensen, L., 12:15509
Feldman, M.J., Consolidated Fuel Reprocessing Program: Progress report for period July 1 to September 30, 1986, 12:15389 (R;US)
Fellinger, J., Influence of different detector parameters on the neutron sensitivity of OSL-detectors, 12:16634 (R;SU)
Fellows, R.J., *See* Cataldo, D.A., 12:16891
Feng, X., Solubility tests on borosilicate glasses for West Valley waste immobilization, 12:15473 (J;US)
Fennell, J.F., *See* Blake, J.B., 12:16935, 12:16939
Fenske, G.R., Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)
Ferdinande, H., *See* Ryckbosch, D., 12:17274
Ferguson, B.W., *See* Massey, J.V., 12:15808
Ferguson, R.R., Decontamination/decommissioning of mixed hazardous and radioactive waste disposal sites, 12:15538 (RA;US)
Fernandez, J.C., Energy efficiency of the CTX magnetized coaxial plasma source, 12:17452 (RA;US)
See Barnes, C.W., 12:17449
Fero, A.H., Neutron and gamma-ray flux calculations for the VENUS PWR engineering mockup, 12:15826 (J;US)
Ferran, M.D., *See* Rense, C.E.C., 12:16282
Ferrara, S., General dimensional reduction of ten-dimensional supergravity and superstring, 12:17388 (J;NL)
Ferreira, J.L., Laser welding metallography, 12:16299 (R;US)
Ferreiradasilva, A., *See* Deandradaesilva, E.A., 12:16359
Ferrett, T.A., Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
See Shirley, D.A., 12:16531
Ferziger, J.H., Simulations of turbulent mixing and reacting flows and their applications to turbulence modeling. Semiannual progress report, 12:16433 (R;US)
Feston, M.C., *See* Wyckoff, S., 12:17028
Fetisov, E.P., *See* Mirzoev, F.Kh., 12:16279
Feustel, H.E., *See* Diamond, R.C., 12:16203
Fickel, L.M., *See* Viner, A.S., 12:15750
Fields, D.E., Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology, 12:15504 (RA;US)
Fife, K.W., *See* Rense, C.E.C., 12:16282
File, J., The LBM program at the EPFL/LOTUS Facility, 12:17524 (J;US)
Filippov, G.F., *See* Badalov, S.A., 12:17372
Fillo, J.P., *See* Gray, R.H., 12:15340
Finfrock, C., *See* Greene, G., 12:16107
Finfrock, S.H., *See* Burnside, R.J., 12:15842
Fink, C.L., *See* Devolpi, A., 12:16014
Fink, U., Planetary spectroscopy, 12:17005 (RA;US)
Finkel'shtejn, K.I., *See* Arsent'ev, V.N., 12:17485
Finn, J.M., Current drive by helicity injection in RFP's and spheromaks, 12:17459 (RA;US)
Finn, P.A., A process to recover tritium from high pressure helium, 12:17612 (J;US)
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
Finnemore, D.K., Superconducting materials, 12:16318 (BA;US)
Fiorini, E., Lepton number non-conservation and double beta decay, 12:17107 (RA;CS)
Firestone, A., *See* Breakstone, A., 12:17121
Firestone, M.A., *See* Ghoniem, N.M., 12:17533
See Kessel, C.E., 12:17418
Firth, K.J., *See* Jones, J.H., 12:15835
Fischbach, E., The fifth force, 12:17126 (R;US)
Fischer, A.K., *See* Johnson, C.E., 12:17580
Fischer, D., Water removal characteristics of fine coal particles, 12:15268 (R;DE;In German)
Fischer, D.F., *See* Wolson, R.D., 12:15384
Fischer, J., X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 12:16652 (J;NL)
Fishburn, J., *See* Sioshansi, P., 12:15704
Fisher, D.R., Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
See Hadley, R.T., 12:16872
Fisher, E.S., *See* Nevitt, M.V., 12:16340
Fisk, Z., *See* Willis, J.O., 12:16285
See Zirngiebl, E., 12:16284
FitzGerald, P.D., *See* Smith, S.T., 12:15565
Fitzpatrick, D.K., Characterization of on-chip polycrystalline silicon photoconductors, 12:16492 (R;US)
Flanagan, C.A., Overview of the Compact Ignition Tokamak, 12:17493 (J;US)
Fleck, J.B., Nuclear project finance in developing countries: The multi-country financing alternative, 12:15894 (RA;XA)
Fleming, G.S., *See* Griest, W.H., 12:16887
Flemming, G.S., *See* Marchok, A.C., 12:16895
Fletcher, G.L., *See* Miley, D.V., 12:16269
Fletcher, T.H., *See* Dunn-Rankin, D., 12:15333
See Niksa, S., 12:15334
Flexser, S., *See* Mathews, M.A., 12:15347
Flinn, J.E., *See* Miley, D.V., 12:16269
Fluss, M.J., A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation, 12:16307 (BA;US)
See Howell, R.H., 12:16312
Flynn, T., Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada, 12:15627 (J;US)
Focke, A.B., *See* Boyce, M.P., 12:15689
Foeldy, L., External field Dirac equation with separable potential, 12:17383 (R;HU)
See Hrasko, P., 12:17384
Folting, K., *See* Chamberlain, L.R., 12:16409
Fong, E., *See* Scalise, D.T., 12:15760
Formisano, B.D., *See* Estill, W.B., 12:16322
Fortin, X., *See* Babonneau, D., 12:17431

Fortson, E.N., *See* Van Dyck, R.S. Jr., 12:17085
Fowler, J.S., *See* Arnett, C.D., 12:16816
Fox, G.C., Caltech Concurrent Computation Program: Annual report, 1985-86, 12:17645 (R;US)
See Gottschalk, T.D., 12:16682
Fox, G.L., Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
Fox, R.A., *See* Roberson, P.L., 12:16877
Fraas, L.M., *See* Cape, J.A., 12:15614
Fradkin, M.I., *See* Kurnosova, L.V., 12:17284
Fraley, R.T., *See* Hood, E.E., 12:16803, 12:16804
Francey, R.J., Carbon isotope measurements in baseline air, forest canopy air, and plants, 12:16749 (BA;US)
Francis, A.J., *See* Krishna, C.R., 12:15269
Frandsen, S., *See* Beurskens, J., 12:15648
Franer, F., Strengths and weaknesses of cogeneration units - application of small and medium size cogeneration plants in short-distance heating systems, 12:15672 (RA;DE;In German)
Frank, G.W., *See* Milakovic, J., 12:16598
Frank, R.C., Trapping of deuterium in argon-implanted nickel, 12:16302 (J;US)
Frankenburg, P.E., Laboratory studies of the filtration performance of various filter media under simulated field conditions, 12:15312 (RA;US)
Franks, W.A., *See* Geller, L., 12:15909
Franzke, G., *See* Becker, M., 12:15618
Frarey, J.L., Vibration signature analysis at Philadelphia Electric, 12:15690 (RA;US)
Fraser, P.J., Atmospheric CO_2 record from direct chemical measurements during the 19th century, 12:16745 (BA;US)
Frazier, M.E., *See* Fisher, D.R., 12:16871
Freeburn, H.R., Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
Freedman, D.Z., *See* de Wit, B., 12:17394
Freeman, A.J., *See* Norman, M.R., 12:16342
Freeman, J.M., *See* Kunze, J.F., 12:17537
Freeman, L.B., *See* Tessler, G., 12:15864
Freeman, S.E., Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers, 12:16882 (J;US)
Freese, K.E., *See* Matos, J.E., 12:15869
Freiman, S.W., Fracture mechanisms in lead zirconate titanate ceramics, 12:16338 (BA;US)
Frevert, E., Non-contacting thickness-gauging of fine steel plates, 12:15580 (R;AT;In German)
Freyer, H.D., Interpretation of the Northern Hemispheric record of $^{13}C/^{12}C$ trends of atmospheric CO_2 in tree rings, 12:16748 (BA;US)
Friberg, K.M., Chemotaxis and algal attachment of caulobacter, 12:16829 (RA;US)
Fricke, G., *See* Shera. E.B., 12:17224
See Wohlfahrt, H.D., 12:17223
Fricke, V.R., *See* Rainisch, R., 12:16116
Frieje, S.A., *See* Whitley, R.H., 12:17504
Friske, J.A., *See* Kubitschek, H.E., 12:16800
Fritsch, W., *See* Lin, C.D., 12:17067
Froehner, F.H., Principles and techniques of data evaluation, 12:17651 (R;DE)
Frohoff, R.A., *See* Benson, R.C., 12:15316, 12:15317
Fromm, W.D., *See* Maerten, H., 12:17245
Fruchter, J.S., *See* Olsen, K.B., 12:16930
Fryer, R.M., *See* Seidel, B.R., 12:16016
Fu, C.Y., Evaluation and testing of double differential Fe(n,n') cross sections, 12:17327 (J;US)
Fuentes, H.R., Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)
Fuentes, P., *See* Gauchon, J.P., 12:15772
Fuermaier, B., Pyrolysis and dumping: Are they alternatives to waste incineration, 12:16498 (RA;DE;In German)
Fujioka, K., *See* Fukushi, S., 12:15908
Fujita, S., Plume washout and wet deposition of trace elements around the coal-fired power plant, 12:15318 (R;JP;In Japanese)
Fujita, Y., High-definition television evaluation for remote handling task performance, 12:16452 (J;US)
See Draper, J.V., 12:16453
Fukui, Y., Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)
Fukushi, S., Nuclear fuel cycle variables calculation code - FUTURE, 12:15908 (J;US)
Funatsu, M., *See* Fukushi, S., 12:15908
Fung, I.Y., Analysis of the seasonal and geographical patterns of atmospheric CO_2 distributions with a three-dimensional tracer model, 12:16756 (BA;US)
See Heimann, M., 12:16743
See Tucker, C.J., 12:16736
Funke, H., Approximate two-soliton solution of a generalized Schroedinger equation in nuclear hydrodynamics, 12:17375 (R;SU)
Funshtejn, V.B., *See* Selitskij, Yu.A., 12:17249
Furuya, K., *See* Fukushi, S., 12:15908
Fuzesy, R., *See* Alexander, J., 12:16659

G

Gabathuler, R., Auxin regulation of a proton translocating ATPase in pea root plasma membrane vesicles, 12:16808 (J;US)
Gabriel, J.R., Deriving properties of systems from properties of parts and lists of connections, 12:17640 (R;US)
Gabriel, T.A., *See* Johnson, J.O., 12:16661
Gadioli, E., *See* Augustyniak, W., 12:17228
Gadioli Erba, E., *See* Augustyniak, W., 12:17228
Gaffney, E.S., Modeling of buried explosions, 12:16678 (R;US)
Gaffney, J.S., *See* Senum, G.I., 12:15365
See Walsh, J.J., 12:16786
Gaier, J.R., Effects of graphitization on the environmental stability of brominated pitch-based fibers, 12:16362 (R;US)
Gaisser, T.K., High energy neutrino absorption and its effects on stars in close x-ray binaries, 12:17037 (R;US)
See Ayres, D.S., 12:17094
Gal, A., SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
Gal, E., Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
Galambos, J.D., System studies of Compact Ignition Tokamaks, 12:17535 (J;US)
Galayda, J.N., Construction and commissioning of the national synchrotron light source, 12:16504 (RA;US)
Gale, I.N., Heat flow and regional groundwater flow in the United Kingdom. Investigation of the geothermal potential of the UK, 12:15626 (R;GB)
Galeev, A.A., Magnetopause stability threshold for patchy reconnection, 12:16949 (RA;CS)
Galegher, S.J., *See* Sears, R.E., 12:15583
Galfayan, S.Kh., *See* Akopov, N.Z., 12:16609
Galin, J., Fusion with projectiles form carbon to argon at energies between 20A and 60A MeV, 12:17243 (R;FR)
Gallagher, R.E., *See* Brown, D.A., 12:16127
Galloway, D.J., Magnetoconvection, 12:17090 (RA;CS)
Galloway, W.D., *See* Durant, W.S., 12:15386
Galmiche, D., Electron acceleration by a localized electric field, 12:17396 (R;FR)
Gammage, R.B., *See* Vo-Dinh, T., 12:15345
Gammon, R.H., Global atmospheric CO_2 distribution 1968-1983: interpretation of the results of the NOAA/GMCC measurement program, 12:16742 (BA;US)
See Komhyr, W.D., 12:16762
See Tucker, C.J., 12:16736
Gandini, A., GPT methods for fuel evolution and shuffling studies, 12:15929 (J;US)
System reliability analysis via generalized perturbation theory methods, 12:15930 (J;US)
Gansow, O.A., *See* Brechbiel, M.W., 12:16841
Gantner, E., *See* Coerdt, W., 12:16430
See Zaghloul, R., 12:16391
Gantt, E., *See* Ohki, K., 12:16806
Gao, G.R., A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Gao, H.W., Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
Gar'kusha, G.N., *See* Bondarenko, O.A., 12:16643
Garbutt, K., Effects of elevated CO_2 on plants. III. Flower, fruit and seed production and abortion, 12:16910 (J;GB)

Gardner, F.W., Northrop Triga facility decommissioning plan versus actual results, 12:16066 (J;US)
Garner, F.A., Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
Garner, J.K., An inherently safe tandem mirror fusion blanket concept, 12:17512 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Garuchava, Z.Sh., *See* Azhinenko, I.V., 12:17104
Garvey, G.T., [International conference and symposium on unified concepts of many-body problems]: Symposium summary, 12:17298 (R;US)
Gaskell, G., Consumer energy conservation policies and programmes in Britain, 12:16166 (R;DE)
Gaskins, T., *See* Raffray, A.R., 12:17599
Gasparian, A.P., *See* Cheplakov, A.P., 12:17211
Gasparini, G., Decontamination of some liquid wastes of medium activity with a new solvent type, 12:15427 (R;FR;In Italian)
Gasparyan, A.P., *See* Armutlijskij, D.A., 12:17116
Gauchon, J.P., Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)
Gaudez, M.T., *See* Billon, A., 12:16387
Gaudie, S.C., *See* Chamberlain, H.E., 12:15429
Gauthier, J.H., *See* Peters, R.R., 12:15438
Gavalyan, V.G., Time and amplitude characteristics of multiwire detectors, 12:16608 (R;SU;In Russian)
Gayley, H., *See* Chung, P., 12:15694
Gebski, J.S., *See* Wheildon, J., 12:15628
Geenen, G., *See* Voorde Van de, N., 12:15428
Gehl, S., *See* Rowland, T.C., 12:15780
Geist, A., *See* Drake, J., 12:15622
Geist, G.A., *See* Wood, R.F., 12:16370
Geist, P., Streak camera and picosecond metrology of laser impulses running at high repetitive rates, 12:16602 (R;FR;In French)
Gelb, A., *See* Bloomfield, D., 12:16193
Gelbard, E.M., Monte Carlo narrow resonance calculational techniques for treating double-heterogeneity effects, 12:15858 (J;US)
Geller, L., Choosing the optimum burnup, 12:15909 (J;US)
Gelles, D.S., Radiation embrittlement of manganese-stabilized martensitic stainless steel, 12:16276 (R;US)
George, T.F., *See* Battaglia, 12:16345
Gerard, E., *See* Irvine, W.M., 12:17025
Gerber, S.B., *See* Smedskjaer, L.C., 12:16309
Gerding, T.J., *See* Ebert, W.L., 12:15413
Gerich, C., *See* Cabayan, H.S., 12:17488
Gerlach, T.M., Evaluation of gas data from high-temperature fumaroles at Mount St. Helens, 1980-1982, 12:16740 (J;NL)
Germain, A., *See* Burda, T.J., 12:15635
Gertz, C.P., Spent-fuel transportation - a success story, 12:15401 (J;US)
Gervaise, F., *See* Carre, F., 12:17426
Gettemy, D.J., *See* Barnes, N.P., 12:16471
Gevorkyan, V.A., *See* Atabekyan, R.R., 12:17344
Ghen, R.D., Ground and excited state photoconductivity measurements of Ce^{3+}:YAG, 12:16352 (R;US)
Ghia, S., *See* Famiglietti, M., 12:15700
Ghoniem, N.M., The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets, 12:17533 (J;US)
See Blanchard, J.P., 12:17602
See Grotz, S.P., 12:17603
See Levin, P., 12:17604
See Orient, G.E., 12:17601
Ghusn, G. Jr., *See* Flynn, T., 12:15627
Giacomelli, G., *See* Amos, N., 12:16657
Giaquinto, L., The Italian programmes for wind energy, 12:15659 (BA;US)
Gibbs, A.J., *See* Hammond, R.B., 12:16491
Gibbs, M., Effect of light and development of photosynthetic cells: Final report, 12:15602 (R;US)
Gibbs, R., *See* Greiner, G.P., 12:15311
Gibson, J., *See* Williams, J.G., 12:17016
Giebink, D.R., *See* Ernst, D.J., 12:17301
Giefer, D.L., *See* Bengel, P.R., 12:16129
Gierszewski, P., *See* Abdou, M., 12:17529
See Embrechts, M.J., 12:17594
See O'Brien, D.A., 12:17600
See Steiner, D., 12:17516
Gierszewski, P.J., Fission reactor experiments for solid breeder blankets, 12:17531 (J;US)
Gies, R.A., *See* Ballou, J.E., 12:16881
Giesecke Sara-Lafosse, C.R., World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Gijbels, J., *See* Voorde Van de, N., 12:15428
Gil, T.K., PROCESS - a source term calculation program for the PC, 12:16113 (J;US)
Gilbert, E., *See* Coerdt, W., 12:16430
Gilbert, M., Multiphoton dissociation of UF6 at lambda = 16 μm in supersonic jets, 12:16400 (R;FR)
Gilbert, T.L., Manual for implementing residual radioactivity guidelines, 12:15494 (RA;US)
Gilbert, W.D., Experience with water chemistry control in cycling units at Detroit Edison, 12:15732 (RA;US)
Gillett, N.A., *See* Mauderly, J.L., 12:16893
Gilli, P.V., Development of advanced water-to-water heat pumps in the range of 200- to 5000-kW thermal output: prestudy, 12:16206 (R;US)
Gilligan, J.G., *See* Holliday, M.R., 12:17579
Gillitzer, A., Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
Gilman, F.J., *See* Cox, B., 12:17155
Gilman, R., *See* Morris, C.L., 12:17212
Gilmore, E.H., Wind characteristics, northwest Texas region, 12:15634 (BA;US)
Ginsberg, T., Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1, 12:16141 (J;US)
Giometti, C.S., *See* Zhang, J.S., 12:16795
Girod, M., Static and dynamic aspects of nuclear matter distribution: microscopic calculations and experimental data, 12:17253 (R;FR;In French)
Gittus, J., Water reactor fuel element performance computer modelling, 12:15796 (B;US)
Glakpe, E.K., *See* Asfaw, A., 12:16480
Glasgow, B.B., Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
See McCarville, T.J., 12:17591
Glasgow, T.K., *See* Tewari, S.N., 12:16288
Glashausser, C., *See* Morris, C.L., 12:17212
Glass, S.W., *See* Stevens, D.M., 12:15947
Glassley, W.E., Reference waste package environment report, 12:15451 (R;US)
Gleisberg, F., *See* Exkstein, P., 12:16557
Glenn, R.D., *See* Hickey, C.R., 12:15515
See Johnson, N.R., 12:15525
Glimm, J., The role of better algorithms, 12:17680 (BA;US)
Glotov, A.I., *See* Exkstein, P., 12:16557
Glowacka, L., *See* Augustyniak, W., 12:17228
Gmuca, S., Neutron reactions on Ti isotopes from near threshold to 20 MeV, 12:17271 (RA;CS)
Godfrey, P., *See* Irvine, W.M., 12:17025
Godfrey, P.J., Design of a drinking-water-quality monitoring program, 12:16783 (R;US)
Godsey, T.T., *See* Tallent, O.K., 12:15469
Goebel, D.M., Pump limiter experiments and engineering, 12:17577 (J;US)
Goeltz, R., *See* Hirst, E., 12:16207
See Tonn, B., 12:16913
Goff, T.E., *See* Tucker, C.J, 12:16779
Gohar, Y., Trade-off study of liquid metal self-cooled blankets, 12:17595 (J;US)
See Finn, P.A., 12:17539
Goldberg, B.A., High-resolution imaging of solar system objects, 12:16975 (RA;US)
Goldberg, L., *See* Tessler, G., 12:15864
Golden, M.P., *See* Phillips, E.C., 12:15544
Goldenbaum, G.C., Critical field index for passive coil stabilization of the shift instability, 12:17458 (RA;US)
See Antoniades, J., 12:17457
Goldhaber, A.S., *See* Auerbach, N., 12:17300
Goldman, A.J., *See* Holland, J.W., 12:15978
Goldman, A.S., Rejection of outliers in thermal neutron coincidence counting, 12:16668 (J;US)
Goldman, S.R., *See* Dingus, R.S., 12:16466
Goldreich, P., *See* Soifer, B.T., 12:16990
Goldstein, D.L., Resource utilization by desert quail: time and energy, food and water, 12:16843 (J;US)
Goldstein, J.I., The role of point defects on structural phase transitions: Progress report for the year 1986-1987, 12:16355 (R;US)
Goldstein, L., *See* Geller, L., 12:15909
Goldstein, M., 3-D world modeling with updating capability based on combinatorial geometry, 12:16440 (R;US)
Goldston, R.J., *See* Meyerhofer, D.D., 12:17442
Goles, R.W., *See* Holton, L.K. Jr., 12:15478
Gombosi, T.I., Icy-glue model of cometary nuclei, 12:16960 (R;HU)

Gomez Mariles, A., *See* Tapia Garcia, F., 12:15892
Gommersbach, M., *See* Casser, E., 12:16153
Gonsalves, L.L., UMTRA consent form acquisition: a survey of nonrespondents, 12:15497 (RA;US)
Gonzales, A.J., On-line diagnosis of turbine-generators using artificial intelligence, 12:15696 (RA;US)
Gonzalez, E.M., Primordial shear and the question of inflation, 12:17047 (R;DK)
See Jones, B.J.T., 12:17048
Gonzalez, R., Calculation RTGV, 12:16007 (R;FR;In French)
Goodess, C.M., *See* Bradley, R.S., 12:16693
See Palutikof, J.P., 12:16772
Goodfellow, H.D., Process fugitive particulates - design methods for enclosures, 12:16703 (RA;US)
Goodman, F.R., Price targets for wind turbines in utility applications, 12:15663 (BA;US)
Goodman, L., Close-fitting shield doors with sculptured edges, 12:15391 (J;US)
Goodman, M.M., *See* Knapp, F.F. Jr., 12:16813
Goodstine, S.L., Recommended water chemistry practices for high pressure-drum type boilers, 12:15711 (RA;US)
Gorbics, M., *See* Breakstone, A., 12:17121
Gordley, L.L., *See* Remsberg, E.E., 12:16707
Gordon, B.M., *See* Hanson, A.L., 12:16534
Gordon, J.D., *See* Garner, J.K., 12:17512
See Whitley, R.H., 12:17504
Gorenshtejn, M.I., Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)
Gormsen, B.B., Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)
Goro, I., *See* Takehiko, I., 12:16506
Gosling, J.T., *See* Tsurutani, B.T., 12:16967
Gottlieb, A., The New York University Ultracomputer, 12:17676 (BA;US)
Gottschalk, T.D., Hypercube tracking: A preliminary status report, 12:16682 (R;US)
See Cox, B., 12:17155
Gould, G.C., Steam turbine chemistry - a review, 12:15713 (RA;US)
Goumondy, J.P., Tritium management in PWR fuel reprocessing plants, 12:15410 (R;FR;In French)
Goutiere, G., *See* Lameille, J.M., 12:16350
Goverdovskij, A.A., Energy dependence peculiarities of fragment mean kinetic energy at nuclei fission by neutrons, 12:17248 (RA;CS)
Govorkov, A.B., Fock representation for quaternion fields, 12:17173 (R;SU;In Russian)
Goy, G.C., *See* Casser, E., 12:16153
Grad, G.A., *See* Arsent'ev, V.N., 12:17485
Graham, L.J., Acoustic emission monitoring of steam turbines: a review of progress, 12:15698 (RA;US)
Graham, W.G., *See* Schlachter, A.S., 12:17081
Gramenitskij, I.M., *See* Baldin, A.M., 12:17201
Grant, T.J., *See* Ostrow, S.L., 12:15543
Grauman, J.S., *See* Schutz, R.W., 12:16320
Graumlich, L.J., *See* Spaulding, W.G., 12:16696
Graves, H., *See* Philippacopoulos, A.J., 12:16005
Graves, N.L., *See* Whitehead, D.W., 12:16101
Gray, H.B., *See* Hopkins, M.D., 12:16410
Gray, L.W., Interfacing solvent extraction in the recovery of pyrochemical residues at the Savannah River Plant, 12:15387 (R;US)
Reprocessing fuel from the Southwest Experimental Fast Oxide Reactor at the Savannah River Plant, 12:15385 (R;US)
Gray, R.H., Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results, 12:15340 (RA;US)
Gray, W.J., Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine, 12:15447 (R;US)
Greek, K., LWR system simulation and transient analysis package on the Oregon State cyber-VE, 12:15790 (J;US)
Green, A., *See* Oddone, P., 12:16654
Green, D.A., *See* Allen, C.C., 12:16723
Green, J.L., *See* Menietti, J.D., 12:16982
Green, M.C., *See* Thomas, G.E., 12:16538
See Young, L., 12:16540
Greenberg, R., *See* Chapman, C.R., 12:17003
Greene, G., Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)
Greenly, J.B., *See* Schamiloglu, E., 12:17480
Greenwell, B.E., *See* McGowan, C.W., 12:15374
Gregoire, C., *See* Delagrange, H., 12:17260
Greiner, G.P., Advanced ESFF applied to a stoker coal-fired boiler, 12:15311 (RA;US)
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
Grender-Jones, D., *See* Fakonas, A.D., 12:15912
Grenet, *See* Azou, P.Y., 12:16270
Gribbin, J., Temperatures rise in the global greenhouse, 12:16735 (J;GB)
Griest, W.H., Separations and synthesis support of pharmacokinetic studies, 12:16887 (RA;US)
Griffin, E.A., Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
Grigalashvili, N.S., *See* Cheplakov, A.P., 12:17211
Griggs, D.P., Determination of station blackout frequency-duration relationships, 12:16125 (J;US)
Loss of pressurizer water level during station blackout, 12:16123 (J;US)
Grigoryan, S.G., *See* Alanakyan, R.A., 12:17129
Grimm, K.N., Feedback simulation of ramped power transients using transfer functions, 12:15931 (J;US)
Time constants and feedback transfer functions of EBR-II [Experimental Breeder Reactor] subassembly types, 12:15973 (R;US)
Grimsditch, M., Elastic properties of superlattices, 12:16260 (R;US)
Grimsditch, M.H., *See* Nevitt, M.V., 12:16340
Grisham, D.L., Future of remote handling, 12:16451 (J;US)
Monitor III, 12:15923 (J;US)
Grishin, V.G., *See* Baldin, A.M., 12:17201
Grishin, V.N., *See* Ado, Yu.M., 12:16553
Grodzka, P., *See* Drake, J., 12:15622
Groenier, W.S., *See* Feldman, M.J., 12:15389
Groos, M., *See* Azou, P.Y., 12:16270
Gross, D.L., Implementation of decommissioning criteria in the conceptual design of the MRS facility, 12:15507 (RA;US)
Grotz, S.P., Steady-state and transient thermal hydraulics of a breeder-in-tube blanket design, 12:17603 (J;US)
Grover, J., *See* Abdou, M., 12:17529
Grubb, W.T., Evaluation of acid-resistant synthetic needled felt filter media in coal-fired boiler pulse-jet baghouses, 12:16357 (RA;US)
Gruen, D.M., High efficiency direct detection of ions from resonance ionization of sputtered atoms, 12:16396 (P;US)
Gruetzmacher, K.M., Data base for failure/maintenance at the Tritium Systems Test Assembly, 12:17614 (J;US)
Grupe, K.F., *See* McGraw, J.R., 12:17657
Guberman, S., *See* Bloomfield, D., 12:16193
Gubernatis, J.E., The spatial dependence of spin and charge correlations in a one-dimensional, single impurity, Anderson model, 12:17350 (R;US)
Gubrienko, K.I., Relativistic positronium channel at the IHEP accelerator, 12:16555 (R;SU;In Russian)
Guentensperger, W., Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)
Guerin, M.R., *See* Griest, W.H., 12:16887
Guesten, H., *See* Coerdt, W., 12:16430
Guey, C.N., Four-train support always more reliable than a two-train support?, 12:16097 (J;US)
Gulden, W., *See* Borgwaldt, H., 12:16145
Gulino, D.A., Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)
Gulkis, S., *See* Menietti, J.D., 12:16982
Gulshani, P., Model for stratified flow in a CANDU reactor header manifold, 12:16137 (J;US)
Gundorin, N., *See* Kliman, J., 12:17250
Gung, C., *See* Youssef, M.Z., 12:17509
Guo Chengzhan, MNSR - A satisfactory tool for training and teaching, 12:15990 (RA;XA)

Gupta, R., More on the first order chiral symmetry transition in QCD, 12:17160 (R;US)
Solving QCD using Monte Carlo Renormalization Group method, 12:17182 (R;US)
Gurol, H., MINIMARS choke coil design, 12:17607 (J;US)
Gusak, A.A., *See* Alferov, V.N., 12:16554
Gusev, G.A., Investigation of superhigh-energy cosmic rays (approximately 10/sup 20/eV) by means of a phase interferometer, 12:17057 (RA;SU;In Russian)
Guth, A.H., The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
The new inflationary universe, 1984, 12:17389 (BA;US)
Gutowski, W.J. Jr., Effects of dynamic heat fluxes on model climate sensitivity: meridional sensible and latent heat fluxes, 12:16759 (J;US)
Guyer, C.E., *See* Soine, W.H., 12:16818
Guyette, M., *See* Draulans, J., 12:16442
Gwinn, D.A., *See* Beck, W.K., 12:17608

H

Hack, R.K., *See* Boreel, L.J., 12:15656
Hadid, A.H., Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Hadley, R.T., Implementation of microdosimetry codes on mini-computers, 12:16872 (RA;US)
Hadlock, D.E., *See* Faust, L.G., 12:16875
Hagen, S., PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Hagenson, R.L., *See* Miller, R.L., 12:17503
Hagentoft, C.E., Simulation of heat losses and ground temperatures for district-heating culverts. Comparison with field experiments for well-insulated, damaged, and extra-insulated culverts, 12:16227 (R;US)
Hager, E.R., *See* Spampinato, P.T., 12:17432
Hagewood, B.T., Water and steam chemistry control experiences with fossil peaking units, 12:15733 (RA;US)
Haggard, D.L., *See* Ballou, J.E., 12:16881
See Faust, L.G., 12:16875
Haggard, K.V., *See* Remsberg, E.E., 12:16707
Hagino, S., *See* Yato, T., 12:15814
Hagmann, S., *See* Schlachter, A.S., 12:17081
Hahn, H., Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
See Cowen, J.A., 12:16255
Hahn, K.D., Quasistatic modelling of the coaxial slow source, 12:17467 (RA;US)
Hahn, L., Probabilistic safety analysis for Sizewell B - Proof of Evidence, established on behalf of the Friends of the Earth, London, within the framework of the Sizewell B Power Station Public Inquiry, 12:16036 (R;DE;In German, English)
Hahn, W., Study including experiments on the diffusion emissions caused by accidents, 12:16711 (R;DE;In German)
Hahn, W.T., Damage assessment in composites by acoustic-ultrasonic technique. Final report, September 1985-August 1986, 12:16346 (R;US)
Haissinski, J., Jets in e/sup +/-e/sup -/ collisions, 12:17110 (RA;CS)
Hajduk, J.C., *See* Ahluwalia, R.K., 12:15679
Haldy, P.A., *See* File, J., 12:17524
Hale, V.Q., Environmental assessment relating to the decommissioning of Strontium Semiworks facility, 12:15503 (RA;US)
Hales, J.W., *See* Makenas, B.J., 12:15853
Halicioglu, T., Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
Hall, C.A.S., Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
Hall, D., *See* Lempicki, A., 12:16472
Hall, D.N.B., Research in planetary astronomy and operation of the 2.2-meter telescope, 12:16976 (RA;US)
Hall, G., *See* Croft, M., 12:16303
Hall, J.F., Review of secondary side tube degradation processes in PWR steam generators, 12:15812 (J;US)
Hall, M.B., *See* Lutton, J.M., 12:15852
Hall, R.I., Dissociative electron attachment, 12:17075 (RA;CS)
Haltiwanger, R.C., *See* Coons, D.E., 12:16415
Halvorson, H.O., Studies on manganese oxidizing spore forming bacteria, 12:16839 (RA;US)
Hamann, N., Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)
Hamasaki, S., Plasma resistivity near null magnetic field region in FRC, 12:17476 (RA;US)
Hamblen, D.G., *See* Solomon, P.R., 12:15278, 12:15279, 12:15280
Hamel, M., *See* Ed, D., 12:15548
Hamel, W.R., Evaluating teleroobotics for battlefield support operations, 12:16441 (R;US)
Hamilton, D.R., Joint CDRH (Center for Devices and Radiological Health) and state quality-assurance surveys in nuclear medicine: Phase 2 - radiopharmaceuticals, 12:16861 (R;US)
Hamilton, D.S., Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)
See Ghen, R.D., 12:16352
See Pogatshnik, G.J., 12:16351
Hamilton, W.R., *See* Flanagan, C.A., 12:17493
Hammer, D.A., *See* Schamiloglu, E., 12:17480
Hammer, J.H., *See* Hartman, C.W., 12:17482
Hammond, R.B., GaAs photoconductors to characterize picosecond response in GaAs integrated devices and circuits, 12:16491 (R;US)
See Fitzpatrick, D.K., 12:16492
See Ibrahim, B.B., 12:16674
Hampala, O., *See* Pecinka, L., 12:16038
Hampel, W., Solar neutrino experiments, 12:17106 (RA;CS)
Handel, S.J., *See* Draper, J.V., 12:16453
Haneda, T., *See* Masuda, J., 12:15817
Hanel, R.A., *See* Jennings, D.E., 12:16977
Hanis, T., Application of ionizing radiation in food and feeds processing. Proceedings of seminar, 12:16844 (R;CS;In Czech)
Changes due to radiation or thermal sterilization in vitamin A level, acidity number and peroxide value of various fats in mixes with cereals, 12:16846 (RA;CS;In Czech)
See Bondy, R., 12:16847
Hanjalic, K., Analysis of a two-stream direct coal-gasification system, 12:15296 (BA;US)
Hankins, D.E., Personnel neutron dosimetry using CR-39 foils, 12:16879 (R;US)
Hankins, O.E., *See* Hillis, D.L., 12:17415
Hanley, N.E., *See* Knell, K.C., 12:15818
Hannaman, G.W., *See* Spurgin, A.J., 12:16068
Hansen, F.R., Electron cyclotron resonance heating of a high-density plasma, 12:17416 (R;DK)
Hansen, K.F., Parity simulation for nuclear plant analysis, 12:15928 (J;US)
Hansen, W.R., *See* Gilbert, T.L., 12:15494
Hansl-Kozanecka, T., *See* Atwood, W.B., 12:16658
Hanson, A.L., Trace element measurements using white synchrotron radiation, 12:16534 (R;US)
See Wallwork, J.C., 12:16907
Hanson, G.G., New drift chamber for the Mark II detector at the SLAC linear collider, 12:16653 (J;NL)
Hanson, J., *See* Lambrecht, R.M., 12:16822
Hara, K., Stability and vibration of internal windings of superconducting solenoid magnets, 12:17610 (J;US)
Harben, P.E., Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)
Harbottle, G., *See* Walsh, J.J., 12:16786
Hardeman, J.C. Jr., *See* Ronca-Battista, M., 12:15553
Harding, D.G., *See* Slough, J.T., 12:17463
Harding, L.B., The reaction of atomic hydrogen with the formyl radical, 12:16435 (BA;US)
Harima, Y., *See* Trubey, D.K., 12:16450
Harker, W.C., *See* Barnes, N.P., 12:16471
Harker, Y.D., Reactivity analyses of Schlumberger samples, 12:16923 (R;US)
Harlow, F., *See* Dembo, M., 12:16801, 12:16802
Harlow, F.H., Super problems for supercomputers, 12:17681 (BA;US)
Harmon, B.D., *See* Anderson, G.L., 12:15270
Harmon, D.L., *See* Cowherd, C. Jr., 12:16702
See Goodfellow, H.D., 12:16703
See Hooks, W., 12:15749
Harms, W.O., The U.S. fast reactor materials and structures program, 12:15866 (BA;US)

Harne, R.L., *See* Jones, J.H., 12:15835
Harper, F.T., Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Smart approach to level-1 probabilistic risk assessment, 12:16080 (J;US)
Harper, G., A 300 kV isolation platform at the University of Washington, 12:16543 (R;US)
Harr, R., *See* Alexander, J., 12:16659
Harrell, J.R., Experimental determination of the partition coefficient of HOI, 12:16104 (J;US)
Harris, D.B., Conceptual design of a large E-beam-pumped KrF laser for ICF commercial applications, 12:17558 (J;US)
Conceptual design of a hybrid KrF laser system for ICF commercial applications, 12:17559 (J;US)
See Pendergrass, J.H., 12:17563
Harris, R.D., Calculations for determining appropriate key radionuclides for failed fuel analysis, 12:15827 (J;US)
Modeling of Ge(Li) gamma-ray spectra, 12:16126 (J;US)
Harris, T.B., *See* Komhyr, W.D., 12:16762
Harrison, D., *See* Stevens, D.M., 12:15947
Harrison, W., *See* Paddock, R.A., 12:16237
Hart, G.W., Internal magnetics of the S-1 Spheromaks, 12:17440 (RA;US)
See Ellis, R. Jr., 12:17439
See Janos, A., 12:17441
See Levinton, F.M., 12:17444
See Meyerhofer, D.D., 12:17442
Harten, B., Preliminary investigation of organisms capable of degrading dieldrin and aromatic compounds: techniques for isolation and characterization, 12:16830 (RA;US)
Hartman, C.W., Acceleration of compact torus plasma rings in a coaxial rail-gun, 12:17482 (RA;US)
Hartmann, E., *See* Lorenz, M., 12:17660
Hartmann, W.K., *See* Chapman, C.R., 12:17003
Hassan, Y.A., Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2, 12:16087 (J;US)
Discussion of the numerical stability of an improved upwinding scheme, 12:16481 (J;US)
Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident, 12:16086 (J;US)
Modifications and assessment of rewetting correlations for light water reactor system analysis, 12:16134 (J;US)
See Morgan, C.D., 12:16089
Hassanein, A.M., The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Hassberger, J.A., Implicit Kalman filter algorithm for nuclear reactor analysis, 12:15963 (J;US)
Hasselbrink, E., *See* Dueren, R., 12:17079
Hassenzahl, W.V., Heater induced quenches in SSC [Superconducting Super Collider] model dipoles, 12:16565 (R;US)
Hastings, L.L., *See* Sims, R.C., 12:16221, 12:16222
Hauck, C.A., *See* Lietzke, A.F., 12:16566
Hauenschild, R., Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers, 12:16477 (R;DE;In German)
Haug, A., A modeling study of the Culebra dolomite, 12:16921 (R;US)
Haugen, D.A., Genotoxic effects of binary mixtures of polycyclic aromatic hydrocarbons, 12:16899 (RA;US)
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)
See Gray, R.H., 12:15340
See Stamoudis, V.C., 12:15336
Haughian, J., *See* Scalise, D.T., 12:15760
Hawley, K.A., Hazard waste risk assessment, 12:15444 (RA;US)
See Kennedy, W.E. Jr., 12:15443
Hayashi, S., *See* Fujita, Y., 12:16452
Hayashide, Y., *See* Fukui, Y., 12:16611
Hayatsu, R., *See* Winans, R.E., 12:15300
Hayes, K., *See* Alexander, J., 12:16659
Hayes, T.D., *See* Srivastava, V., 12:15585
Haynes, L., *See* Kunze, J.F., 12:17537
Hays, G.N., *See* Rice, J.K., 12:16467
Haywood, F.F., Review of current research into soil decontamination and volume reduction techniques for purposes of transportation and disposal, 12:15517 (RA;US)
He, W., *See* Liu, N., 12:16581
Headley-Walker, L., USNY college degrees: three successful collaborations to fulfill NRC requirements, 12:15940 (J;US)
Healy, J.W., *See* Gilbert, T.L., 12:15494
Heaphy, R.F., Performance of a high-sulfur-coal, pilot-scale fabric filter, 12:15747 (RA;US)
Hearst, J.E., *See* Zhu, Y.S., 12:16796
Hearst, J.R., Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
See Mathews, M.A., 12:15347
Heath, J.R., Formation of long carbon chain molecules during laser vaporization of graphite, 12:16424 (J;US)
Hebron, D.E., *See* Leeper, R.J., 12:17487
Heck, W., Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment, 12:16074 (J;US)
Heckendorn, F.M., Remote lighting systems for the defense waste processing facility, 12:15481 (J;US)
Remote viewing of melter interior: defense waste processing facility, 12:15483 (J;US)
Hecker, H.C., *See* Tessler, G., 12:15864
Hedman, P.O., Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)
Heflin, E.G., *See* Oddone, P., 12:16654
Hege, E.K., *See* Drummond, J.D., 12:17004
Heimann, M., Simulating the atmospheric carbon dioxide distribution with a three-dimensional tracer model, 12:16743 (BA;US)
Heimann, P.A., *See* Shirley, D.A., 12:16531
Hein, K., Short-distance heat supply - introduction, 12:16216 (RA;DE;In German)
Heine, W.F., *See* Speer, D.R., 12:15545
Heinemann, H., *See* Carrazza, J., 12:15297
Heinen, K.U., Renewable energy sources and their uses - application, potentials, economic aspects, 12:16183 (RA;DE;In German)
Heinze, V., Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas, 12:16405 (R;DE;In German)
Heisel, F., *See* Geist, P., 12:16602
Heitman, P.W., *See* Khandelwal, P.K., 12:16339
Held, J., *See* Bertucio, R., 12:16083
Heldt, L.A., Stress corrosion cracking and metal-induced embrittlement: Comparative studies of local chemistries: Progress report for period September 1, 1986-January 15, 1987, 12:16268 (R;US)
Helfand, M., *See* Diegle, R.B., 12:16296
Helfer, H., *See* Exkstein, P., 12:16557
Heller, A.S., *See* Christensen, J.D., 12:16109
Helmer, G.L., *See* Hood, E.E., 12:16803
Hemphill, R.C., *See* Costello, K.W., 12:16171
Henderson, D.B., Computation: The nexus of nuclear weapon development, 12:17677 (BA;US)
Henderson, J.T., Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
Henderson, K.B., SCE experience, 12:15722 (RA;US)
Henderson, R.F., *See* Mauderly, J.L., 12:16893
See Mitchell, C.E., 12:16897
Henderson, T.R., *See* Mitchell, C.E., 12:16897
Hendry, D.P., *See* Cabayan, H.S., 12:17488
Heninger, S.G., *See* Solomon, P.R., 12:15278, 12:15279, 12:15280
Henins, I., Recent helicity source and power supply improvements to CTX, 12:17453 (RA;US)
See Barnes, C.W., 12:17449
See Hoida, H.W., 12:17450
See Knox, S.O., 12:17448
Henley, D.R., *See* Knox, A.E., 12:16542
Hennart, D., *See* Voorde Van de, N., 12:15428
Henniger, J., *See* Fellinger, J., 12:16634
Henning, C.D., TIBER II-An upgraded tokamak ignition/burn experimental reactor, 12:17499 (J;US)
Henseler, G., *See* Deinzer, W., 12:16947
Heredy, L.A., *See* Skowronski, R.P., 12:15308
Herman, Z., Collisional dynamics of low energy charge transfer processes, 12:17077 (RA;CS)
Hermeline, F., Approximation of Fokker-Planck equation by a deterministic particle method, 12:17399 (R;FR;In French)
Hermetz, R.E., Tools for decontamination and decommissioning of nuclear facilities, 12:16456 (J;US)
Use of urethane foam in the decontamination and decommissioning of nuclear facilities, 12:15519 (RA;US)
Hermsdorf, D., *See* Elfruth, T., 12:17237
See Kalka, H., 12:17266
Herndon, J.N., *See* Draper, J.V., 12:16453
See Fujita, Y., 12:16452
Heron, A., Financing electric power in developing countries, 12:15884 (RA;XA)

Herrig, D.M., *See* Levy, S.C., 12:16151
Herrmann, S., *See* Berthelot, C., 12:16386
Herrmannsfeldt, W.B., Heavy-ion fusion: Setting the stage, 12:17615 (J;US)
Herstrom, C.L., *See* Anderson, M.S., 12:16444
Hertel, I.V., Molecular beam studies and quantum chemistry of elementary photochemical processes: electronic to vibrational energy transfer, 12:17078 (RA;CS)
Hess, R.A., *See* Antoniades, J., 12:17457
See Goldenbaum, G.C., 12:17458
Hetrick, D.M., *See* Fu, C.Y., 12:17327
Hettwer, P.F., *See* Burrage, L.M., 12:15668
Heusler, K.E., Some considerations concerning the thermodynamics and kinetics of the reaction between iron and water in bentonite, 12:16406 (R;CH;In German)
Hewett, D.W., Compact torus compression of microwaves, 12:17462 (RA;US)
Heyne, K.G., Systems of short-distance heat supply in modular technique, 12:15671 (RA;DE;In German)
Hickel, B., Thermodynamic properties of hydrated electron, 12:16427 (R;FR;In French)
Hickey, C.R., Radiological characterization of the Weldon Spring Quarry Weldon Spring, Missouri, 12:15515 (RA;US)
Hickox, C.E., *See* Dunn, J.C., 12:15630
Hicks, B.B., Measuring dry deposition: a re-assessment of the state-of-the-art, 12:16731 (J;NL)
Hiester, T.R., *See* Burda, T.J., 12:15635
Hilal, M.A., *See* Gurol, H., 12:17607
Hill, D.N., Recent operation of the tandem mirror experiment-upgrade, 12:17420 (BA;US)
Hill, E.F., *See* Lutton, J.M., 12:15852
Hillesland, T. Jr., *See* Smith, D.R., 12:15649
Hilliard, M.R., *See* Liepins, G.E., 12:17641
Hillis, D.L., The "ring killer" experiment: Electron confinement in the ELMO Bumpy Torus without the influence of hot-electron rings, 12:17415 (R;US)
Hillman, J.J., *See* Deming, D., 12:17019
Hinckley, J.P., Process facility modifications project, 12:15393 (J;US)
Hind, G., *See* Coughlan, S.J., 12:15598
Hinds, S.S., TMI-2 post-accident dose reduction through coating removal, 12:15518 (RA;US)
Hines, H.H., *See* De Nardo, G.L., 12:16820
See Macey, D.J., 12:16819
Hinks, D.G., *See* Vrtis, M.L., 12:17339
Hins, A.G., *See* Knox, A.E., 12:16542
Hinsley, R.J., *See* Barnes, N.P., 12:16471
Hiroe, S., *See* Hillis, D.L., 12:17415
Hirst, E., Determination of household energy using 'fingerprints' from energy billing data, 12:16207 (J;GB)
Determining the extent, benefits, cost, and timing of utility conservation and load management programs, 12:16173 (R;US)
Hiskes, J.R., Review of progress in the theory of volume production, 12:17083 (R;US)
Hively, L.M., Database construction for assessment of chronic radionuclide releases, 12:15554 (RA;US)
Hlavac, S., /sup 52/Cr(n,xnγ)reactions at 14.6 MeV studied by coincident in-beam techniques, 12:17220 (RA;CS)
See Pivarc, J., 12:16509
Ho, C.H., *See* Griest, W.H., 12:16887
Ho, K.M., *See* Liu, S.H., 12:16314
Ho, S.K., An alpha particle distribution function for mirror loss-cone type instability calculations, 12:17419 (J;US)
Ho, T., Design and status of Hefei light source, 12:16584 (RA;US)
Ho, Y.K., Neutron capture mechanism, 12:17276 (RA;CS)
Hoard, C., *See* Alexander, J., 12:16659
Hobbs, W.E., *See* Weatherall, J.C., 12:17424
Hoehn, M.V., *See* Wohlfahrt, H.D., 12:17222, 12:17223
Hof, J.V., *See* Sung, W.K., 12:16842
Hoffman, A.L., Design considerations for a large anti s FRC facility, 12:17464 (RA;US)
See Slough, J.T., 12:17463
Hoffman, D., *See* Marchetti, S., 12:15558
Hoffman, E.E., Fuel system and structural alloy considerations for space nuclear reactor systems, 12:15868 (BA;US)
Hoffman, L.G., *See* Skinner, D.J., 12:15514
Hoffman, M.A., *See* Campbell, R.B., 12:17554
See Raffray, A.R., 12:17568, 12:17599, 12:17605
Hoffmann, K.R., *See* Fluss, M.J., 12:16307
Hofman, G.L., Crystal structure stability and fission gas swelling in intermetallic uranium compounds, 12:16301 (J;NL)
See Pahl, R.G., 12:15848
See Porter, D.L., 12:15850
See Seidel, B.R., 12:15979, 12:16016
Hofmann, P., *See* Hagen, S., 12:16023
Hofmayer, C.H., *See* Bandyopadhyay, K.K., 12:16006
Hogan, W.J., ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Holda, H.W., Local drift parameter, j/n/ sub e/ and resistivity anomaly measurements in CTX spheromaks, 12:17450 (RA;US)
See Barnes, C.W., 12:17449
See Knox, S.O., 12:17448
Holben, B.N., *See* Tucker, C.J, 12:16779
Holberg, J.B., Stellar observations with the Voyager EUV objective grating spectrograph, 12:17020 (RA;US)
Holbrook, J.H., Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)
Holcomb, H.P., *See* Gray, L.W., 12:15387
Holden, N.E., Nuclear data for gadolinium production, 12:15578 (J;US)
Uncertainties in scientific measurements, 12:17216 (R;US)
See Zucker, M.S., 12:17239
Holets, S.H., Wind speed variability in the California Altamont Pass area, 12:15657 (BA;US)
Holladay, D.W., Placement of the radiochemical processing plant at Oak Ridge National Laboratory into a safe standby condition, 12:15534 (RA;US)
Holladay, G., *See* Harben, P.E., 12:15349
Holland, D.F., *See* Jalbert, R.A., 12:17551
Holland, J.R., Multishell inertial confinement fusion target, 12:17491 (P;US)
Holland, J.W., Posttest examination results of recent treat tests on metal fuel, 12:15978 (R;US)
Holland, O.W., *See* Poker, D.B., 12:16316
Hollenberg, G.W., Tritium breeding materials, 12:17628 (BA;US)
Hollenstein, Ch., Broadband magnetic and density fluctuations in the TCA tokamak, 12:17412 (R;CH)
Holliday, M.R., Fusion surface material melting, ablation and ejection under high heat loading, 12:17579 (J;US)
Hollinger, G., *See* Moncoffre, N., 12:16286
Hollingshaus, H., Bechtel automated control of design document data, 12:15820 (J;US)
Holm, D.D., Hamiltonian differencing of fluid dynamics, 12:17093 (J;US)
Holman, M., Proton-recoil neutron spectrometry, 12:16622 (RA;CS;In Czech)
Hologa, J., *See* Williamson, K., 12:15786
Holt, F.E., *See* Bechtold, R.A., 12:15984
Holt, R.J., Nuclear physics with internal targets in electron storage rings, 12:17203 (R;US)
See Thomas, G.E., 12:16538
See Young, L., 12:16540
Holton, L.K. Jr., Equipment experience in a radioactive LFCM vitrification facility, 12:15478 (J;US)
Holub, V., Dynamic measurement on main generating unit of Dukovany Nuclear Power Plant, 12:16056 (RA;CS;In Czech)
Holve, D.J., *See* Dunn-Rankin, D., 12:15333
Holy, N.L., *See* Riley, J.T., 12:15325
Homann, S., *See* Hankins, D.E., 12:16879
Homma, H., *See* Locquet, J.P., 12:17354
Honda, Y., *See* Yato, T., 12:15814
Hongchang, M., *See* Behrens, J.W., 12:16669
Hood, E.E., Hypervirulence of Agrobacterium tumefaciens A281 is encoded in a region of pTiBo542 outside of T-DNA, 12:16803 (J;US)
T-DNA and opine synthetic loci in tumors incited by Agrobacterium tumefaciens A281 on soybean and alfalfa plants, 12:16804 (J;US)
Hook, T.A., Corrosion product transport in a cycling fossil plant, 12:15735 (RA;US)
Hooker, C.D., *See* Roberson, P.L., 12:16877
Hooks, W., Operation and maintenance experience at Harrington Station, 12:15749 (RA;US)
Hoornstra, J., *See* Dunn-Rankin, D., 12:15333
Hoover, M.D., Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Hoovler, G.S., Research reactor and fuel development/production facility decommissioning technology and experience, 12:16067 (J;US)
Hopkins, B., *See* Gil, T.K., 12:16113
Hopkins, C.O., *See* Ehrhardt, F.J., 12:16071

Hopkins, G.R., Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Hopkins, M.D., Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Hopper, R., *See* Eng, J., 12:15527
Hornstra, F., *See* DeLuca, W.H., 12:16149
Horton, J.A., *See* McKamey, C.G., 12:16258
Horwedel, J.E., Upgrade of the GRESS (test version D) precompiler to allow triply-dimensioned arrays, 12:17654 (R;US)
Horwitz, J.L., *See* Comfort, R.H., 12:17413
Hosea, J., *See* Sheffield, J., 12:17492
Hossain, A., Economic aspects of implementing a SMPR project. A case study for Bangladesh, 12:15889 (RA;XA)
Houghton, R.A., Estimating changes in the carbon content of terrestrial ecosystems, 12:16750 (BA;US)
See Woodwell, G.M., 12:16780
Houlberg, W.A., *See* Sheffield, J., 12:17492
Houpis, H.L.F., *See* Gombosi, T.I., 12:16960
House, J.W., *See* Gaffney, E.S., 12:16678
Hovingh, J., A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200, 12:17616 (J;US)
Hovis, L.S., Economics of advanced electrostatic stimulation of fabric filtration, 12:15743 (RA;US)
See Greiner, G.P., 12:15311
See Mosley, R.B., 12:15741
See Vanosdell, D.W., 12:15739
See Viner, A.S., 12:15750
See Yamamoto, T., 12:15740
Howard, J., *See* Metting, N.F., 12:17320
Howard, P.H., *See* Banerjee, S., 12:16909
Howell, G.E., Schedule reconciliation tests for management prudency determination, 12:15915 (J;US)
Howell, J., *See* Barnes, N.P., 12:16471
Howell, R.H., High intensity positron beam and angular correlation experiments at Livermore, 12:16312 (BA;US)
Howells, E., *See* Burrage, L.M., 12:15668
Hower, N., *See* Bachrach, R.Z., 12:16570
Howes, J.E., Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)
Hoyt, D.V., Solar records: the Wolf sunspot index and umbral/penumbral ratio, 12:16694 (R;US)
Hoyt, K.R., *See* Hinds, S.S., 12:15518
Hrasko, P., Coulomb pair-creation, 12:17384 (R;HU)
Hsieh, B.J., *See* Kot, C.A., 12:16019
Hsu, D.K., *See* Kogan, V.G., 12:16485
Hsu, J.T., *See* Ishii, M., 12:16018
Hu, M.H., Turbulence force correlation of PWR steam generator tube bundle flow, 12:15834 (J;US)
Hu, W.L., *See* Gelles, D.S., 12:16276
Hu, Y., *See* Liu, N., 12:16581
Hu Erbang, Evaluation of tetroon flights and turbulent diffusion under weak wind conditions during the field experiment SIESTA, 12:16688 (R;DE)
Influence of stability classification on atmospheric diffusion calculations for elevated releases over a terrain of major roughness, 12:16687 (R;DE)
Hua, T.Q., Experimental modelling of eddy currents and deflection for tokamak limiters, 12:17584 (J;US)
See Turner, L.R., 12:17528
Huang, C.Y., *See* Steinbeck, J., 12:17352
Huang, L., *See* Mathews, M.A., 12:15347
Huang, R.L., Gravity-driven core cooling system for a BWR, 12:16077 (J;US)
Huang, S., *See* Gross, D.L., 12:15507
Hubbard, H.H., *See* Shepherd, K.P., 12:15644
Huber, D.L., University-based user facilities: lessons from Tantalus and Aladdin, 12:16577 (RA;US)
Huber, G., Collinear laser spectroscopy: a new tool in nuclear physics, 12:16625 (RA;CS)
Huberman, E., *See* Jones, C.A., 12:16902
Hubert, F., Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
See Bimbot, R., 12:16559
Hubert, P., *See* Tomachevsky, E.G., 12:15489
Hubis, W., *See* Gray, R.H., 12:15340
Huebner, K., *See* Fellinger, J., 12:16634
Huebner, M.F., Complete sodium removal from equipment, 12:15860 (J;US)
Huffman, J.C., *See* Chamberlain, L.R., 12:16409
Hughes, J.A., Viscosity behavior in supercooled pure liquids and mixtures, 12:16407 (R;US)
Hughes, O.F., Structural optimization of large ocean-going structures, 12:16501 (RA;US)
Hugrass, W., *See* Armstrong, W.T., 12:17470
See Tuszewski, M., 12:17473
Hugrass, W.N., *See* McKenna, K.F., 12:17474
See Rej, D.J., 12:17469
Huhtiniemi, I., *See* Pong, L.C., 12:16140
Huke, K., *See* Tanaka, J., 12:16505
Hulstrom, R., *See* Riordan, C., 12:15597
Hulvey, R.D., *See* Starling, K.E., 12:15304
Hume, H.R., *See* Oschman, K.P., 12:16924
Hummeldorf, R.G., *See* Oschman, K.P., 12:16924
Hung, C.C., Thermal conductivity of pristine and brominated P-100 fibers, 12:16360 (R;US)
Hunter, S.C., *See* Benson, R.C., 12:15315
Hurst, J., *See* Nielsen, B., 12:16308
Hurst, J.K., Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Hurwitz, M.J., Water induction detection system: field testing, 12:15693 (RA;US)
Husain, A., Nuclear thermal-hydraulics education: the Yankee Atomic/ University of Lowell experience, 12:15936 (J;US)
Hussain, Z., *See* Barton, J.J., 12:16323
Hutcheon, D.A., The TRIUMF kaon factory proposal, 12:16569 (R;CA)
Hutchinson, D., *See* Alexander, J., 12:16659
Hutton, P.H., Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Hwang, J.L., *See* Kunze, J.F., 12:17537
Hynds, R.J., *See* Sanderson, T.R., 12:16966

I

Iachello, F., Dynamic symmetries in nuclei and molecules, 12:17263 (RA;CS)
Supersymmetry in nuclear physics, 12:17302 (BA;US)
Ibrahim, B.B., An automated two-dimensional laser velocimeter system, 12:16674 (R;US)
Igarashi, H., *See* Distenfeld, C.H., 12:16013
Iglesias, F.C., *See* Sills, H.E., 12:16022
Ignat'ev, V.V., Experimental investigation of closed-type convective thermosyphon thermal performance as applied to a molten salt power reactor, 12:15836 (R;SU;In Russian)
Ignatovich, V.K., Temperature shift of neutron resonances, 12:17230 (RA;CS)
Igoshin, V.B., *See* Barsukov, A.B., 12:16524
Ikemoto, R.N., *See* Rowland, T.C., 12:15780
Ilyin, M., *See* Smith, D.R., 12:15649
Im, K.H., *See* Ahluwalia, R.K., 12:15679
Imada, M., *See* Kowalski, J., 12:16722
See Shikiya, J., 12:16714
Imai, M., Sound measures feedwater temperature within 1°F consistently, 12:15832 (J;US)
Imam, I., On-line rotor crack detection monitoring system, 12:15695 (RA;US)
Imhoff, K.L., *See* Kennedy, W.E. Jr., 12:15443
Impagliazzo, A.M., Impact of feedwater chemistry on feedwater heater tubes, 12:15715 (RA;US)
Inoyatov, A.Kh., On relative detection efficiency of a channel electron multiplier for electrostatic beta spectrometer, 12:16636 (R;SU;In Russian)
Ioan, I., *See* Arkhipov, V.V., 12:17149
Iosifescu, M., Kronecker products which decompose into two irreducible representations, 12:17374 (R;SU)
Irvine, W.M., International Halley Watch: discipline specialists for radio science, 12:17025 (RA;US)
Irving, J.T., *See* Kniazewycz, B.G., 12:16011
Irving, T.L., *See* Kniazewycz, B.G., 12:16457
Isaev, A.P., Fermionic string model in spaces of Lie group, 12:17176 (R;SU;In Russian)
Isenhower, D., *See* Breakstone, A., 12:17121
Ishii, M., Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)

Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
Ishii, T., Present status of SOR-RING, 12:16578 (RA;US)
Ismatova, F.A., *See* Vorob'ev, I.I., 12:17199
Isnard, P., *See* Gilbert, M., 12:16400
Isobe, T., Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)
Isoyama, G., *See* Ishii, T., 12:16578
Ispiryan, K.A., Nuclear-optical methods for production of polarized photons with energies of a few hundred GeV, 12:17306 (R;SU)
Ispiryan, M.K., *See* Ispiryan, K.A., 12:17306
Itzykson, C., Conformal invariance and finite size effects in critical two dimensional statistical models, 12:17158 (R;FR)
Ivanov, A.N., *See* Volkov, M.K., 12:17151
Ivanov, E., Dualities in the d=2 asymmetric chiral field sigma models, 12:17171 (R;SU)
Izrailevsky, L.B., *See* Solyany, V.I., 12:15797

J

Jackson, H.E. Jr., Note on electron spectrometer requirements for deep inelastic scattering studies, 12:16601 (R;US)
Jacobowsky, Short-distance heat supply in the Ruelzheim recreation center by means of a cogeneration unit and heat pumps, 12:15676 (RA;DE;In German)
Jacobs, D.G., *See* Ferguson, R.R., 12:15538
Jacobs, M., National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report, 12:16211 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement, 12:16212 (R;US)
National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982, 12:16214 (R;US)
Jaeger, E.F., *See* Hillis, D.L., 12:17415
Jaffa, R., *See* Embrechts, M.J., 12:17594
Jaffrezic, H., *See* Moncoffre, N., 12:16286
Jagiello, G., *See* Sung, W.K., 12:16842
Jahn, H., Proton-channel related analysis of 14 MeV (n,xn)-reactions, 12:17272 (RA;CS)
Jahn, U., *See* Exkstein, P., 12:16557
Jakus, K., *See* Ritter, J.E., 12:16330
Jalbert, R.A., Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
See Nasise, J.E., 12:17545
Jalby, W., Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
James, W., *See* Stevens, D.M., 12:15946
Jameson, R.A., High-brightness rf linear accelerators, 12:16513 (R;US)
Janeschitz, G., *See* Mueller, E.R., 12:17407
Janhsen, U., *See* Beppler, E., 12:16239
Janos, A., Global magnetic fluctuations in S-1 spheromak plasmas and relaxation toward a minimum-energy state, 12:17441 (RA;US)
See Ellis, R. Jr., 12:17439
See Hart, G.W., 12:17440
Jansen, H.J.F., *See* Norman, M.R., 12:16342
Janta, J., Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
Janzen, V.P., *See* Riedinger, L.L., 12:17235
Jaquish, R.E., *See* Kennedy, W.E. Jr., 12:15443
Jarboe, T.R., Generalized helicity and its time derivative, 12:17451 (RA;US)
Los Alamos Spheromak Program, 12:17447 (RA;US)
See Barnes, C.W., 12:17449
See Fernandez, J.C., 12:17452
See Henins, I., 12:17453
See Hoida, H.W., 12:17450
See Knox, S.O., 12:17448
See Platts, D.A., 12:17454
See Wright, B.L., 12:17455
Jardine, L.J., Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities, 12:15402 (J;US)
Jarmie, N., Requirements for charged-particle reaction cross sections in the d-d, d-t, t-t, and d-^{3}He fuel cycles, 12:17484 (R;US)
Jaros, J., *See* Alexander, J., 12:16659
Jaskola, M., *See* Augustyniak, W., 12:17228
Jassby, D.L., Overview of the TFTR Lithium Blanket Module program, 12:17523 (J;US)
See Cohn, D.R., 12:17543
See File, J., 12:17524
Javornicky, K., *See* Jursova, L., 12:16628
Jayanti, S., Passive steam-driven injector as ECCS for an inherently safe BWR, 12:16078 (J;US)
Jedelhauser, P., *See* Bucher, F., 12:15432
Jeger, P., *See* Bucher, F., 12:15432
Jelen, P., *See* Bondy, R., 12:16847
Jellison, G.E. Jr., Time-resolved ellipsometry and reflectivity measurements of the optical properties of silicon during pulsed excimer laser irradiation, 12:16369 (J;US)
See Lowndes, D.H., 12:16368
See Wood, R.F., 12:16370
Jenevein, R.M., *See* deMelo, J., 12:17671
Jenkins, T.M., Unique radiation problems associated with the SLAC Linear Collider, 12:16516 (R;US)
Jennings, D.E., Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers, 12:16977 (RA;US)
See Deming, D., 12:17019
Jensen, L., Legal and ethical issues raised in considering residential decontamination options for technologically-enhanced radioactive contamination, 12:15509 (RA;US)
Jensen, T.H., Generalization of the Taylor Principle, 12:17479 (RA;US)
Jeppson, D.W., Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Jervis, R.E., Slowpoke-2: Laboratory reactor for neutron irradiation, 12:15987 (RA;XA)
Jewitt, D.C., Optical investigation of Comet Halley, 12:17006 (RA;US)
Jiang, D., *See* Zhang, Y., 12:16585
Jimenez, B., *See* Shugart, L., 12:16892
Joannopoulos, J.D., *See* Payne, M.C., 12:16266, 12:16354
Jochheim, H., Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)
Johansen, J., *See* Barclay, W., 12:15613
Johanson, E.W., *See* Fenske, G.R., 12:15849
Johns, W.L., *See* Yashan, D., 12:16295
Johnson, B.M., Atomic physics and synchrotron radiation: The production and accumulation of highly charged ions, 12:17058 (R;US)
See Jones, K.W., 12:16533
Johnson, C.E., Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)
See Hollenberg, G.W., 12:17628
See Johnson, I., 12:15965
Johnson, D.W., The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Johnson, I., Downstream behavior of fission products, 12:15965 (R;US)
Johnson, J.K., *See* Holladay, D.W., 12:15534
Johnson, J.O., Development and testing of a Monte Carlo code system for analysis of ionization chamber responses, 12:16661 (J;US)
Johnson, K.M., *See* Sculthorpe, B.R., 12:15823
Johnson, M.B., *See* Auerbach, N., 12:17300
See Ernst, D.J., 12:17301
Johnson, M.L., *See* Normand, E., 12:17122
Johnson, N.R., In situ monitoring technique for determining post remedial action concentrations of radium in soil, 12:15525 (RA;US)
Johnson, Q.C., Micro-tomography using synchrotron radiation, 12:16397 (BA;US)
Johnson, T.V., Infrared observations of outer planet satellites, 12:16978 (RA;US)
Johnson, W.J., *See* Lahti, G.P., 12:16115
Johnston, B.M., *See* Henning, C.D., 12:17499
Johnston, R.B., *See* Riley, B.A., 12:17642
Jolly, W.L., Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Jonas, O., Cost of corrosion and scale in US utilities, 12:15709 (RA;US)

Deaerators - design and operation, effect on water chemistry, corrosion problems, 12:15716 (RA;US)
Transport of chemicals in steam cycles, 12:15718 (RA;US)
Jones, B.G., Thermal hydraulics in nuclear engineering at UIUC, 12:15938 (J;US)
See Ehrhardt, F.J., 12:16071
Jones, B.J.T., Correlation functions for the clustering of galaxies and Abell clusters, 12:17045 (R;DK)
Cosmology and galaxy formation. An introduction to some recent ideas, 12:17048 (R;DK)
See Gonzalez, E.M., 12:17047
Jones, C.A., Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay, 12:16902 (RA;US)
Jones, C.R., *See* Dutta, J.M., 12:17400
Jones, D.B., ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
Jones, D.E., Pioneer 10 and 11 (Jupiter and Saturn) magnetic field experiments. Final report, 12:17032 (R;US)
Jones, D.F., Effect of technology on the economics of low-level waste disposal, 12:15461 (J;US)
Jones, D.R.T., Towards a theory of fermion masses: A two-loop finite $\nu=1$global SUSY GUT, 12:17395 (BA;US)
Jones, E.D., Decontamination and decommissioning of extraction cell 3 at the West Valley Demonstration Project, 12:15522 (RA;US)
Jones, J.E., Early galactic evolution and the nature of the first stars, 12:17049 (R;DK)
See Jones, B.J.T., 12:17045
Jones, J.H., Streamlined one-pass modelling, 12:15835 (J;US)
Jones, K.W., Design considerations for a combined synchrotron-light source and heavy-ion storage ring Atomic Physics Facility, 12:16533 (R;US)
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
See Hanson, A.L., 12:16534
See Johnson, B.M., 12:17058
See Lipman, J.J., 12:16884
See Morris, C.L., 12:17212
See Wallwork, J.C., 12:16907
Jones, M.L., *See* Young, B.C., 12:15332
Jones, N.D., *See* Simmons, R.L., 12:15956
Jones, P.D., *See* Bradley, R.S., 12:16693
See Wigley, T.M.L., 12:16690
Jones, R.K., *See* Mauderly, J.L., 12:16893
Jones, R.R., Criticality safety evaluation for pathfinder fuel elements in model No. RA-3 shipping containers, 12:15398 (R;US)
Jones, T.D., Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
Jones, T.J. Jr., *See* Davidson, M.J., 12:15702
Joshi, N.B., Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Jounier, *See* Azou, P.Y., 12:16270
Jouper, A., Is the ability of microorganisms to degrade polycyclic aromatic hydrocarbons plasmid mediated?, 12:16831 (RA;US)
Jousset, J.C., *See* Dural, J., 12:16536
Juhasova, E., Synthetic seismic shifts and prospects of application, 12:15967 (RA;CS;In Slovak)
Jung, J., *See* Sze, D.K., 12:17514, 12:17547
See Youssef, M., 12:17589
Jurik, T.W., Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)
Jursova, L., Automated beta spectrometer, 12:16628 (R;CS;In Czech)
Justice, M., *See* Breunlich, W.H., 12:17207
Justus, A.L. Wynveen, R.A., *See* Robinet, M.J., 12:15531

K

Kabanov, L.P., *See* Zemlyanukhin, V.V., 12:16032
Kadhim, A.B., *See* Al-Janabi, T., 12:17231
Kahler, A.C., *See* Tessler, G., 12:15864
Kahn, M., *See* Mirzadeh, S., 12:16432
Kahr, G., *See* Mueller-Vonmoos, M., 12:15433
Kai, M., *See* Bonaca, M.V., 12:16112
Kaiser, W.D., *See* Tuten, J.M., 12:15688
Kalashnikova, Yu.S., Quarks degrees of freedom and deuteron static moments, 12:17287 (R;SU)
Kalinin, A.I., *See* Dinh Sy Hien, 12:16631
Kalinovskij, Yu.L., Semileptonic decays of ordinary and charmed Λ/sup +/ sub(c) baryons in chiral theory, 12:17145 (R;SU)
Kalk, J.J., Remote tool development at the interim examination and maintenance (IEM) cell, 12:16001 (J;US)
Kalka, H., Exciton Model and multistep-compound reactions, 12:17266 (RA;CS)
See Elfruth, T., 12:17237
Kaline, E., *See* Bartlett, R.J., 12:16324
Kalt, A., *See* Becker, M., 12:15618
Kamal, S.A., Transient bowing of core assemblies in advanced liquid metal fast reactors, 12:15846 (R;US)
Kamata, E., *See* Fukushi, S., 12:15908
Kamei, Y., *See* Yato, T., 12:15814
Kamihira, M., Response of small laboratory animals to coal fly ash inhalation, 12:15344 (R;JP;In Japanese)
Kaminski, R.S., *See* Crowley, J.H., 12:16180
Kanda, S., *See* Fukui, Y., 12:16611
Kaneko, M., *See* Domoto, K., 12:15845
Kanemasu, E.T., *See* Chaudhuri, U.N., 12:16906
Kang, C.H., *See* Chambre, P.L., 12:15476
Kania, D.R., *See* Bartlett, R.J., 12:16324
Kaplan, S.N., *See* Perez-Mendez, V., 12:16655
Karaffa, M., Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory, 12:16716 (R;US)
Karakouzian, M., *See* Oschman, K.P., 12:16924
Karbushev, N.I., Manifestation of sleeping-instability in partially-compensated relativistic electron beams, 12:16525 (RA;SU;In Russian)
Karibyan, M.D., *See* Bagdasaryan, D.S., 12:16548, 12:16605, 12:16606
Karim, C.S., *See* Hossain, A., 12:15889
Kark, J.B., Rapid estimation of ^{226}Ra in soil for the Grand Junction RASA/UMTRA Project, 12:15532 (RA;US)
Karl, T.R., Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
Karliner, M., *See* Banks, T., 12:17156
Kartavtsev, V.I., *See* Belyaev, V.B., 12:17177
Kartuzhanskij, A.L., *See* Akopova, A.B., 12:16607
Kashdan, E.R., *See* Goodfellow, H.D., 12:16703
Kassawara, R.P., *See* Kot, C.A., 12:16019
Kassen, W.R., Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report, 12:15771 (R;US)
Kassner, T.F., Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
See Shack, W.J., 12:15764
Kastenberg, W.E., *See* Yeh, H.C., 12:15830
Kasuga, T., Overview of the UVSOR facility, 12:16576 (RA;US)
Kasza, K.E., *See* Choi, U.S., 12:16200
Katsoka, I., *See* Ishii, M., 12:16018
Katsaurov, L.N., *See* Barit, I.Ya., 12:16558
Katz, M.E., *See* Benko, G., 12:16962
Katz, N., *See* Blake, J.B., 12:16935, 12:16939
Katzenstein, J., Injection and trapping of intense neutralized ion beams in closed magnetic configuration, 12:17481 (RA;US)
Kaufman, I., Radiometric detection of cracks on stationary and moving surfaces, 12:15707 (RA;US)
Kawamoto, N., *See* Abdalla, E., 12:17181
Kawase, Yoichi, *See* Yoshizawa, Yasukazu, 12:16646
Kawashima, Y., *See* Yato, T., 12:15814
Kaya, S., Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Kaye, M.E., *See* Borden, W.C., 12:15513
Kaye, S., *See* Sheffield, J., 12:17492
Kazacha, V.I., *See* Kazarinov, N.Yu., 12:16526
Kazachenko, O.N., Application of quasi-random numbers for simulation, 12:17650 (R;SU;In Russian)
Kazakov, D.I., *See* Ermushev, A.V., 12:17159

Kazanas, D., Two states of CYG X-1 and related sources, 12:17038 (R;US)
Kazarinov, N.Yu., On tolerances for random perturbations of accelerating electric field in the KUTI-20 induction accelerating system (LUEhK-20), 12:16526 (R;SU;In Russian)
Kazaryan, G.B., *See* Bagdasaryan, D.S., 12:16548, 12:16605, 12:16606
Kazimi, M.S., *See* Malinovic, B., 12:17548
Keane, A.T., Long-term loss of radium in 63 subjects first exposed at ages 6 to 46, 12:16855 (R;US)
See Schlenker, R.A., 12:16856
Kearney, P., *See* Gonsalves, L.L., 12:15497
See Provencher, R., 12:15530
Kearney, P.D., *See* Kark, J.B., 12:15532
Keeling, C.D., Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
See Heimann, M., 12:16743
See Tucker, C.J., 12:16736
Kehoe, W.L., *See* McMahan, M.A., 12:16650
Kelbch, S., *See* Schlachter, A.S., 12:17081
Keller, R., *See* Hollenstein, Ch., 12:17412
See Smith, H.V. Jr., 12:16564
Kelley, V.A., Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
Kelly, J.L., *See* Harrell, J.R., 12:16104
See Lutz, J.B., 12:16105
Kelly, P.M., *See* Bradley, R.S., 12:16693
See Wigley, T.M.L., 12:16690
Kelly, V., *See* Soden, R.A., 12:15767
Kembhavi, A., *See* Isobe, T., 12:17039
Kemper, C.T., *See* Gonzales, A.J., 12:15696
Kempf, C.R., *See* Siskind, B., 12:15439
Kennedy, D., *See* Anderson, M.S., 12:16444
Kennedy, W.E., *See* Gilbert, T.L., 12:15494
Kennedy, W.E. Jr., Allowable residual contamination levels for decommissioning: revisions to the method, 12:15492 (RA;US)
Environmental protection support and assistance, 12:15443 (RA;US)
See Denham, D.H., 12:15442
Kephart, T.W., *See* Weiler, T.J., 12:17161
Kerkhoff, H.G., *See* Shirley, D.A., 12:16531
Kerkhove, E., *See* Ryckbosch, D., 12:17274
Kerner, D., *See* Eskenazi, D., 12:15616
Kerns, J.A., *See* Miller, J.R., 12:17606
Kersnovskij, S.V., *See* Ignat'ev, V.V., 12:15836
Kerstein, A.R., *See* Niksa, S., 12:15334
Kervegant, Y., *See* Gauchon, J.P., 12:15772
Kessel, C.E., Determination of gross plasma equilibrium from magnetic multipoles, 12:17418 (J;US)
Keynan, A., *See* Halvorson, H.O., 12:16839
Keyvan, S., *See* Van Echo, A., 12:15847
Khachaturyan, M.N., *See* Arkhipov, V.V., 12:17149
Khalimonchuk, V.A., Calculation technique and results of nonstationary fields of energy release in RBMK reactors, 12:15962 (R;SU;In Russian)
Khandelwal, P.K., Slow crack growth in sintered silicon nitride, 12:16339 (BA;US)
Khanna, S.K., Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)
Kharkar, D.P., Laboratory protocol for co-contaminated waste, 12:15539 (RA;US)
Khatib-Rahbar, M., QUASAR: a methodology for quantification of uncertainties in severe-accident source terms, 12:16102 (J;US)
Quasar uncertainty study, 12:16004 (R;US)
Khokhlov, Yu.K., *See* Barit, I.Ya., 12:16558
Khudaverdyan, A.G., *See* Arkhipov, V.V., 12:17149
Kidder, R.E., On the degree of verification needed to support a comprehensive test ban, 12:16685 (R;US)
Kidman, R.B., *See* Cox, A.N., 12:16963
Kienast, F., Radiodensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth, 12:16773 (R;US)
Killough, S.M., *See* Hamel, W.R., 12:16441
Kim, C.L., *See* Chambre, P.L., 12:15474
See Lee, W.W.L., 12:15475
Kim, J.H., *See* Hassan, Y.A., 12:16481
Kim, J.I., Chemical behaviour of Np, Pu and Am in various concentrated salt solutions, 12:16429 (R;FR;In German)
See Lierse, C., 12:16431
See Stumpe, R., 12:16388
Kim, K.H., *See* Leeper, R.J., 12:17487
Kim, S., *See* Fukui, Y., 12:16611
Kim, S.B., *See* Ishii, M., 12:16017
Kim, S.J., *See* Averback, R.S., 12:16259
Kim, T.W., LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique, 12:16096 (J;US)
Kim, Y.S., *See* Battaglia, 12:16345
See Chun, M.H., 12:16136
Kimbrough, C.W., *See* Ferguson, R.R., 12:15538
Kimura, M., *See* Lin, C.D., 12:17067
Kimura, Y., *See* Ohta, M., 12:16117
King, L.J., TURF Californium facility at Oak Ridge National Laboratory, 12:15577 (J;US)
King, M.J., *See* Andrews, L.M., 12:16182
King, M.S., Experimental studies of elastic-wave propagation in a columnar-jointed rock mass, 12:16926 (J;US)
King, P., *See* Brummert, A.C., 12:15360
King, P.J., Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
King, R.B., *See* Antoine, A.C., 12:16195
King, R.L., *See* Barnes, N.P., 12:16471
King, R.W., An integrated plant-life extension program for EBR-II [Experimental Breeder Reactor], 12:15975 (R;US)
See Mott, J.E., 12:15976
See Van Echo, A., 12:15847
Kinney, J.H., *See* Johnson, Q.C., 12:16397
Kinsey, J.S., *See* Cowherd, C. Jr., 12:16702
Kirkham, M.B., *See* Chaudhuri, U.N., 12:16906
Kirkham, R.R., Fiber optic moisture sensor with moisture-absorbing reflective target, 12:16677 (P;US)
Kirnas, I.G., Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face, 12:16645 (R;SU;In Russian)
Kirsch, G.E., *See* Murphy, G.L., 12:15552
Kirsch, J., *See* Koennecke, R., 12:16358
Kiselev, Yu.F., Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)
Kiselevich, I.L., Secondary particle multiplicity in the π/sup -/Ne interactions at psub(π)=6.2 Gev/c, 12:17215 (R;SU;In Russian)
Kislev, H., A fiber sensor neutron streak camera for ICF diagnostics, 12:17569 (J;US)
Initiation of long electrical discharges in dense ICF reactor atmospheres, 12:17561 (J;US)
Kissling, H., *See* Butenko, V.A., 12:16630
Kisurin, V.A., Device for digital data transmission by a coaxial cable, 12:16490 (R;SU;In Russian)
Kitching, P., Review of results from TRIUMF, 12:17120 (R;CA)
Kittel, P., Losses in fountain-effect pumps, 12:16443 (R;US)
Klapka, P.B., *See* Nandy, F.R., 12:15914
Klass, D.L., Energy from biomass and wastes: 1985 update, 12:15599 (R;US)
Klatil, J., Vibration of liquid in partially filled horizontal channel, 12:16049 (RA;CS;In Czech)
Klausmann, R., Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)
Klavetter, E.A., Fluid flow in a fractured rock mass, 12:15437 (RA;US)
Klebanoff, L.E., *See* Barton, J.J., 12:16323
Klein, A., *See* Sze, D.K., 12:17514
Klein, A.C., FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Klein, J.A., The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
Klein, M.J., Planetary submillimeter spectroscopy, 12:16979 (RA;US)
Klein, W.H., *See* Van Den Dool, H.M., 12:16697
Kleinheinz, P., *See* Shera. E.B., 12:17224
Klewe-Nebenius, H., *See* Coerdt, W., 12:16430
Kliauga, P.J., *See* Metting, N.F., 12:17320
Klickman, A.E., *See* Holland, J.W., 12:15978
Kliman, J., Experimental study of γ-ray emission from neutron resonance fission of /sup 235/U, 12:17250 (RA;CS)
Klingner, P.L., *See* Armstrong, W.T., 12:17470
See Rej, D.J., 12:17469
Klinzing, G.E., Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)

Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986, 12:15324 (R;US)
Klir, P., *See* Bondy, R., 12:16847
See Hanis, T., 12:16846
Kljaich, J., *See* Chisholm, G.H., 12:16028, 12:17644
Klotz, P.J., *See* Lee, Y.N., 12:16732
Klotz, R.J., *See* Anderson, C.K., 12:15781
Knacke, R.F., Infrared spectroscopy of Jupiter and Saturn, 12:16980 (RA;US)
International Halley Watch: discipline specialists for infrared spectroscopy and radiometry, 12:17026 (RA;US)
Knapik, E., *See* Arkhipov, V.V., 12:17149
Knapp, F.F. Jr., Nuclear medicine: Progress report for quarter ending September 30, 1986, 12:16813 (R;US)
See Soine, W.H., 12:16818
Knauss, K.G., Dependence of albite dissolution kinetics on pH and time at 25°C and 70°C, 12:16928 (J;US)
Knecht, M.A., Defining greater-than-class-C low-level radioactive waste, 12:15453 (J;US)
Knell, K.C., Evaluation of feedwater systems for reactor scram reduction, 12:15818 (J;US)
Knizazewycz, B.G., Experience with the Surveyor mobile robot in radioactive work environments, 12:16457 (J;US)
Implication of remote technology for decontamination activities, 12:16011 (RA;US)
Knitter, H.-H., *See* Straede, Ch., 12:17246
Knott, M.J., *See* Hua, T.Q., 12:17584
See Turner, L.R., 12:17528
Knox, A.E., Progress on the IPNS Enriched Uranium Booster Target, 12:16542 (R;US)
Knox, S.O., Determination of CTX equilibria, 12:17448 (RA;US)
See Fernandez, J.C., 12:17452
See Henins, I., 12:17453
Knudson, D.A., Estimated monthly emissions of sulfur dioxide and oxides of nitrogen for the 48 contiguous states, 1975-1984: Volume 2, Supporting data bases and monthly SO_2 and NO/sub x/ estimates by state, 12:16770 (R;US)
Kobriger, L., *See* Chamberlain, L.R., 12:16409
Kobrin, P.H., *See* Shirley, D.A., 12:16531
Koch, T., Arguments against energy from waste, 12:16489 (RA;DE;In German)
Kocher, D.C., National and international considerations of a de minimis dose, 12:15491 (RA;US)
Proposed classification scheme for high-level and other radioactive wastes, 12:15458 (J;US)
Kochkin, V.I., *See* Belyaev, V.B., 12:17177
Kocks, U.F., *See* Rollett, A.D., 12:16283
Koelling, D.D., What underlies the Anderson Hamiltonian, 12:17357 (R;US)
See Norman, M.R., 12:16342
Koenig, J.F., *See* Seidel, B.R., 12:16016
Koenig, J.L., Chemical bonding technology: Direct investigation of interfacial bonds, 12:15604 (R;US)
Koennecke, R., EC static high-temperature leach test. Summary report of an European Community interlaboratory round robin, 12:16358 (R;FR)
Koga, R., *See* Blake, J.B., 12:16935, 12:16939
Kogai, T., *See* Takei, K., 12:15783
Kogan, V.G., Characterization of flaws using the zeroes of the real and imaginary parts of the ultrasonic scattering amplitude, 12:16485 (J;US)
Kohler, D.F., *See* Howes, J.E., 12:16715
Kohlgrueber, K., Energy optimisation of industrial furnaces by optimum control, 12:16500 (R;DE;In German)
Kolaczkowski, A.M., Summary of core damage frequency from internal initiators: Peach Bottom, 12:16082 (J;US)
See Medford, G.T., 12:16120
Kolesnikov, V.V., *See* Kiselevich, I.L., 12:17215
Kolibal, J.G., TFTR offsite dose levels from fusion radiation and effluent releases, 12:17553 (J;US)
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
See Liew, S.L., 12:17571
Komhyr, W.D., Global atmospheric CO_2 distribution and variations from 1968-1982 NOAA/GMCC CO_2 flask sample data, 12:16762 (J;US)
See Gammon, R.H., 12:16742
Komochkov, M.M., *See* Buchnev, V.N., 12:16641
Kondo, K., *See* Fukui, Y., 12:16611
Kononov, A.V., *See* Dem'yanov, A.V., 12:16562
Konstantinidis, S., *See* Rejf, P., 12:16045
Koppe, R.H., Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)
Korchemskij, G.P., Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory, 12:17170 (R;SU)
Korman, A., *See* Rondio, J., 12:17221
Korobov, V.I., *See* Bel'skij, N.P., 12:16515
Korshennnikov, A.A., Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)
Korshover, J., *See* Angell, J.F., 12:16691
Kosako, K., *See* Youssef, M., 12:17589
See Youssef, M.Z., 12:17509
Koskinas, G.J., *See* Singleton, M.F., 12:15373
Kostezh, A.B., *See* Zdesenko, Yu.G., 12:16644
Kostiuk, T., *See* Deming, D., 12:17019
See Mumma, M.J., 12:16971
Kot, C.A., Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)
See Malcher, L., 12:16020
Kounnas, C., *See* Ferrara, S., 12:17388
Koutcher, J.A., *See* Ackerman, J.L., 12:16327
Kovach, W.D., Utility perspectives on decommissioning - the accounting involvement, 12:16065 (J;US)
Koval, C., Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987, 12:16423 (R;US)
Koval'chuk, G.U., UBVRI-photometry of the antiflare stars V586 Ori and IU Ori, 12:16958 (R;SU;In Russian)
Kowalcyzk, R.S., *See* Young, L., 12:16540
Kowalczyk, R.S., *See* Thomas, G.E., 12:16538
Kowalski, J., Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Kowalski, J.F., Radioactive and electron microscope analysis of effluent monitor sample lines, 12:15969 (J;US)
Kozma, P., *See* Bem, P., 12:17278
Kozman, T.A., *See* Cabayan, H.S., 12:17488
Kraft, J., Aldehyde toxicity and load of immissions from motor vehicles, 12:16905 (R;DE;In German)
Kraimer, M.R., *See* Strauss, M.G., 12:16600
Krakowski, R.A., *See* Miller, R.L., 12:17502, 12:17503
Krall, N.A., *See* Bogart, S.L., 12:17586
See Hamasaki, S., 12:17476
Kramer, J.E., *See* da Roza, R.A., 12:16915
Kraner, H.W., *See* Beuttenmuller, R., 12:16660
Kranert, M., *See* Bidlingmaier, W., 12:16774
Krantz, W.B., *See* Visser, W., 12:15331
Krause, A., Problems of decision-making in the fields of biology and ecology under the aspect of environmental policy, 12:16157 (R;DE;In German)
Krause, R., *See* Exkstein, P., 12:16557
Krayushkin, A.V., *See* Khalimonchuk, V.A., 12:15962
Kreider, K.A., Operational experiences with a remote core-boring device, 12:16130 (J;US)
Kreidl, T.J., *See* Baum, W.A., 12:16995
Kreidl, T.J.N., *See* Bowell, E.L.G., 12:16997
Krejci, P., *See* Hanis, T., 12:16846
Kremer, H., Experimental investigation of the formation of nitrogen oxides in combustion of coal dust. 2nd intermediate report covering the period from May 1, 1983 to June 30, 1984, 12:15329 (R;DE;In German)
Krick, M., *See* Enssling, N., 12:16663
Krick, M.S., *See* Goldman, A.S., 12:16668
Krieger, F., *See* Baier, J., 12:15394
Krishna, C.R., Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)
Krishnadev, M.R., *See* Lucas, G.E., 12:17573
Kristiak, J., *See* Kliman, J., 12:17250
Kroodsma, R.L., Resource management plan for the Oak Ridge Reservation: Volume 24, Threatened and endangered animal species, 12:16782 (R;US)
Kroon, P., Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Kropivyanskij, B.N., *See* Zdesenko, Yu.G., 12:16644, 12:17226
Kroto, H.W., *See* Heath, J.R., 12:16424
Krstulovich, S.F., Fermilab Central Computing Facility: Energy conservation report and mechanical systems design optimization and cost analysis study, 12:16550 (R;US)

Kruger, W., Turbine supervisory instrumentation, 12:15692 (RA;US)
Krumpelt, M., *See* Minkov, V., 12:16188
Krupnyj, G.I., *See* Belogorlov, E.A., 12:16556
Kruse, V.J., *See* Rackliffe, G.B., 12:15666
Krusius, M., Quantized vortices in rotating superfluid /sup 3/He, 12:17092 (RA;CS)
Kruskal, C.P., *See* Lee, G., 12:17674
Ku, L.P., *See* Kolibal, J.G., 12:17525, 12:17553
See Liew, S.L., 12:17571
Kubitschek, H.E., Determination of bacterial cell volume with the coulter counter, 12:16800 (J;US)
Increase in cell mass during the division cycle of Escherichia coli B/rA, 12:16840 (J;US)
Kucera, D.A., *See* Meneghetti, D., 12:15863, 12:15974
Kucera, G.H., *See* Pierce, R.D., 12:16196
See Smith, J.L., 12:16189, 12:16190
Kuchin, A.V., *See* Khalimonchuk, V.A., 12:15962
Kuck, D.J., *See* Lee, G., 12:17674
See Polychronopoulos, C.D., 12:17666
Kuhler, M., *See* Kraft, J., 12:16905
Kuhn, R., *See* Baier, J., 12:15394
Kuhn, W.L., *See* Brouns, R.A., 12:15445
Kuijpers, J., Radiation from turbulent plasmas, 12:17404 (RA;CS)
Kulcinski, G.L., Fusion power: One answer to U.S. energy needs in the 21st century, 12:17625 (BA;US)
See Sviatoslavsky, I.N., 12:17511
Kumakhov, M.A., *See* Avakyan, H.R., 12:17070
Kunde, V.G., *See* Jennings, D.E., 12:16977
Kunze, J.F., Design study and supporting experiments for an axially symmetric anchor for a tandem mirror, 12:17537 (J;US)
Kunze, P., German bundle shear - cold test results, 12:15390 (J;US)
Kunzweiler, V.L., Design of repairs to upgrade 10-year-old industrial precipitators, 12:15313 (RA;US)
Kupershmidt, B.A., *See* Holm, D.D., 12:17093
Kurck, J., *See* Breunlich, W.H., 12:17207
Kurnosenko, A.I., *See* Azhinenko, I.V., 12:17104
Kurnosova, L.V., Energy spectra of secondary electrons with E>100 MeV at altitudes of 300-500km for shells of L=2-4, 12:17284 (RA;SU;In Russian)
Kurstedt, H.A. Jr., Fundamental research of decision support systems: Final report, 12:15563 (R;US)
Kurzeja, R.J., *See* Remsberg, E.E., 12:16707
See Weber, A.H., 12:16769
Kuts, V.N., *See* Zdesenko, Yu.G., 12:16644, 12:17226
Kutukcuoglu, A., Cost and financing of nuclear power program in Turkey, 12:15903 (RA;XA)
Kuz'min, V.A., *See* Burtsev, V.A., 12:17414
Kuz'minov, B.D., Measurement and evaluation of nuclear data for nuclear power application, 12:17244 (RA;CS)
See Goverdovskij, A.A., 12:17248
Kuznetsov, A.A., *See* Baldin, A.M., 12:17201
Kuznetsova, M.M., *See* Galeev, A.A., 12:16949
Kwiatek, W.M., *See* Hanson, A.L., 12:16534
Kyanowski, A., Multiplicity dependent light particle correlations in $^{40}Ar + ^{197}Au$ reaction at E/A = 60 MeV°, 12:17236 (R;FR)
Kycia, J.H., *See* Raps, S., 12:16807

L

La Belle, M., *See* Barnard, J., 12:16798
Labahn, K.D., *See* Casser, E., 12:16153
Labarre, S., *See* Praca, C., 12:15409
Lacelle, S., Scaling in biological nuclear magnetic resonance spectral distributions, 12:16817 (J;US)
LaChance, J.L., *See* Drouin, M.T., 12:16084
Lafontaine, L., *See* Draulans, J., 12:16442
Lagage, P.O., Studying reactor antineutron oscillations with large underground detectors, 12:16596 (R;FR)
Lagasse, P.R., Tube wall thickness measurement apparatus, 12:16675 (P;US)
Lahey, R.T. Jr., *See* Peng, S.J., 12:15795
Lahm, C.E., *See* Pahl, R.G., 12:15848
See Seidel, B.R., 12:16016
Lahti, G.P., Reflection of gamma radiation in a spherical concrete-walled room, 12:16115 (J;US)
Laistner, H., Supply-technical, operational, and energy-political assessment of cogeneration plants, 12:15674 (RA;DE;In German)
Lakner, J.F., Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)
Lam, D.J., *See* Ching, W.Y., 12:16329
Lam, N.Q., Formation of submicron metastable phase structures in alloys with focused electron or proton beams, 12:16261 (R;US)
See Sabochick, M.J., 12:16251
Lamb, G.E.R., Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Lamb, G.M., *See* Jennings, D.E., 12:16977
Lambe, J., *See* Khanna, S.K., 12:17342
Lambert, D., Spectral line shapes of X-ray dipoler emission in high densities plasmas, 12:17062 (R;FR)
Lambert, G., *See* Ishii, M., 12:16018
Lambert, J.D.B., *See* Bottcher, J.H., 12:15977
See Lee, M.J., 12:15980
Lambert, J.E., *See* Grisham, D.L., 12:15923, 12:16451
Lambrecht, R.M., Radiopharmaceutical delivery system for controlled arterial concentration in physiologic modeling with computed tomography, 12:16822 (J;US)
Lambright, J.A., *See* Kolaczkowski, A.M., 12:16082
Lameille, J.M., Relationship between leaching of trace elements (Cs, Sr and Co) and microstructure during aging of a mortar with a matrix of artificial Portland cement, 12:16350 (R;FR;In French)
Lamsa, J.W., *See* Breakstone, A., 12:17121
Lamzin, E.A., *See* Eregin, V.E., 12:16568
Land, R.R., *See* Borden, W.C., 12:15556
Lander, G.H., Magnetization density of 5 f electrons in ferromagnetic PuSb, 12:16313 (J;US)
Landwehr, J.B., *See* Kunzweiler, V.L., 12:15313
Lane, W.R., *See* Musgrove, J.G., 12:15751
Lang, K.R., Simultaneous solar maximum mission (SMM) and very large array observations of solar active regions. Annual report, 1 September 1985-30 October 1986, 12:17033 (R;US)
Lang, N.C., The operator interface for the Mirror Fusion Test Facility, 12:17489 (R;US)
Langdon, A.B., *See* Hewett, D.W., 12:17462
Langmuir, D., Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)
Lanning, D.D., *See* Maneke, J.L., 12:16108
Lapidus, I.L., *See* Erzgraeber, G., 12:16858
Lapushkin, S.V., *See* Kiselevich, I.L., 12:17215
Larsen, E.M., The chemistry of molten Li/sub 2/BeF/sub 4/, 12:17581 (J;US)
Larson, B.C., Thermal annealing of vacancy and interstitial loops in ion irradiated copper, 12:16305 (J;US)
See Tischler, J.Z., 12:16306
Larson, H.A., Graduate student use of DSNP at Idaho State University, 12:15933 (J;US)
Larson, S., Cometary spectroscopy, 12:17007 (RA;US)
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Lashko, T.N., *See* Vishnevskij, V.A., 12:16642
Later, D.W., Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products, 12:15292 (RA;US)
See Chess, E.K., 12:15330
See Gray, R.H., 12:15340
See Wilson, B.W., 12:15293
See Wright, C.W., 12:15299
Latesky, S.L., *See* Chamberlain, L.R., 12:16409
Landal, D.L., Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)
Lauffer, J.P., Modal testing in the design evaluation of wind turbines, 12:15654 (BA;US)
Laurens, R.M., *See* Anderson, G.L., 12:15270
Laurie, J.C.V., *See* Coons, D.E., 12:16415
Lauritzen, T., *See* Garner, F.A., 12:16277
Lavdas, L.G., Atmospheric-dispersion index for prescribed burning. Forest Service research paper, 12:16728 (R;US)
Lavelle, M.J., *See* Mathews, M.A., 12:15347
Lavender, J.C., *See* Schneider, K.J., 12:15466
Lavrenov, Yu.I., *See* Khalimonchuk, V.A., 12:15962
Lawrence, L.A., Fuel/cladding chemical interaction correlation for mixed-oxide fuel pins, 12:15957 (J;US)
Lawrie, D.H., *See* Yew, P.C., 12:17673

Lawson, R.D., Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
Lay, *See* Barker, J.S., 12:16681
Lay, R., *See* Seth, S., 12:16100
Layman, W., *See* Chexal, B., 12:16133
Lazar, K., *See* Torardi, C.C., 12:16335
Lazo, E.N., *See* Beck, W.L., 12:15547
Le Beyec, Y., *See* Becker, O., 12:17080
Le Bouhellec, J., *See* Faugeras, P., 12:15380
Le Duff, J., High field electron linacs, 12:16529 (R;FR)
Le Marois, G., *See* Mathiot, A., 12:16034
Leach, F., *See* Zhu, Y.S., 12:16796
Leader, D.R., Using vision systems when bar code won't work, 12:17648 (R;US)
Leaf, G.K., *See* Lam, N.Q., 12:16261
Leahy, T., *See* Bertucio, R., 12:16083
Leary, N., *See* Andrews, L.M., 12:16182
Lebedev, S.Ya., *See* Bagdinov, V.G., 12:16274
Lebofsky, L.A., Infrared observations of planets, 12:17008 (RA;US)
Lebrun, P., *See* Price, L.E., 12:16594
Leclaire, R.J., *See* Cohn, D.R., 12:17543
Leclercq, J., Nuclear power and economics: keys to continuing progress, 12:15920 (J;US)
Ledbetter, M.C., *See* Raps, S., 12:16807
LeDuc, H.G., *See* Khanna, S.K., 12:17342
Lee, B.H., *See* Kim, T.W., 12:16096
Lee, E.P., *See* Hovingh, J., 12:17616
Lee, G., The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)
Lee, G.S., *See* An, Z.G., 12:17483
Lee, J., Battery thermal modeling: The methodology and applications, 12:16148 (R;US)
See Miller, J.F., 12:16234
Lee, J.C., *See* Hassberger, J.A., 12:15963
Lee, J.D., Nuclear performance optimization of the molten-salt fusion breeder, 12:17534 (J;US)
See Henning, C.D., 12:17499
See Moir, R.W., 12:17513
Lee, J.H.S., *See* Berman, M., 12:16144
Lee, K.Y., Preparation of 1,1'-dinitro-3,3'-azo-1,2,4-triazole, 12:16418 (P;US)
Lee, M., *See* Khatib-Rahbar, M., 12:16004
Lee, M.J., Thermal impact of Na_3(U/sub 1-y/Pu/sub y/)O_4 formation on a breached LMR fuel element, 12:15980 (R;US)
See Bottcher, J.H., 12:15977
Lee, M.K., *See* Belshe, R.A., 12:16651
Lee, P., *See* Bartlett, R.J., 12:16324
Lee, R., *See* Ishii, M., 12:16017
Lee, S.Y., *See* Turner, L.R., 12:17528
Lee, T.D., Evolution of weak interactions, 12:17097 (R;XC)
Lee, V.D., *See* Brown, T.G., 12:17494
See Flanagan, C.A., 12:17493
Lee, W.W.L., Cumulative releases of radionuclides from uncontained waste packages, 12:15475 (J;US)
See Chambre, P.L., 12:15474, 12:15476
Lee, Y.N., Chemical composition of precipitation at Long Island, NY, 12:16732 (J;NL)
Lee, Y.Y., *See* Jones, K.W., 12:16533
Leeper, R.J., Intense lithium ion beam diagnostic using the inverse nuclear reactor D(^{7}Li,n)^{8}Be, 12:17487 (R;US)
Lefevre, F., Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Legasov, V.A., Nuclear power safety economics, 12:15870 (R;SU;In Russian)
Legrand, B., *See* Inoyatov, A.Kh., 12:16636
Legro, J.R., *See* Rackliffe, G.B., 12:15666
Lehmann, M., Country risk evaluation by the supplier, 12:15896 (RA;XA)
Leister, P., *See* Baier, J., 12:15394
Lella Di, L., High transverse-momentum jets, 12:17136 (RA;CS)
Lemke, P., *See* Barclay, W., 12:15613
Lempicki, A., Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Lennox, A., *See* Amos, N., 12:16657
See Todd, T.J., 12:16812
Leo, W., *See* Tsang, F.Y., 12:17526
Leo, W.R., *See* File, J., 12:17524
Leon, R., Update on an acoustic doppler technique for detecting resonant turbine blades, 12:15708 (RA;US)
Lepera, F., *See* Lambrecht, R.M., 12:16822
Lerman, A., *See* Paddock, R.A., 12:16237
Lescheck, W.C., *See* Hurwitz, M.J., 12:15693
LeShay, D.W., *See* Koppe, R.H., 12:15770
Lesser, R., *See* De Bievre, P., 12:16389
Lester, D., *See* Pendleton, Y., 12:17035
Leuchs, U., *See* Becker, M., 12:15618
Leung, K.N., *See* Stevens, R.R. Jr., 12:16563
Leung, M.S., *See* Lipeles, R.A., 12:16347
Levai, F., Some experience with operation and use of a training reactor, 12:15992 (RA;XA)
Levashev, V.P., Reduction of integral equations for four identical particles in the case of finite range forces, 12:17370 (R;SU;In Russian)
Levchenko, E.B., On the stability of superconducting systems under slightly chance thermal perturbations, 12:17355 (R;SU;In Russian)
Leventhal, L., *See* Kharkar, D.P., 12:15539
Levermore, C.D., *See* Holm, D.D., 12:17093
Levesque, R.G., *See* Bengel, P.R., 12:16129
Levin, A.Ya., *See* Solyany, V.I., 12:15797
Levin, P., Neutronic optimization of a LiAlO/sub 2/ solid breeder blanket, 12:17604 (J;US)
Levinton, F., *See* Ellis, R. Jr., 12:17439
Levinton, F.M., Summary of electron temperature and density measurements in the S-1 spheromak, 12:17444 (RA;US)
See Meyerhofer, D.D., 12:17442
Levy, S.C., Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system, 12:16151 (BA;US)
Levy, V., *See* Ehrlich, K., 12:16244
Lewis, G.K., *See* Dixon, R.D., 12:16473
Lewis, H.R., *See* Barnes, D.C., 12:17475
Lewis, M.A., Effects of gamma radiolysis on waste package components, 12:16263 (R;US)
Lewis, P., *See* Bloomfield, D., 12:16193
Leznov, A.N., Algebraic construction of soliton solutions related to sl(2,R) algebra, 12:17364 (RA;SU;In Russian)
Li, H., *See* Bennett, R.H., 12:15450
Li, J.C.M., Chemical potential in a stressed solid, 12:17341 (R;US)
Li, M.H., *See* Starling, K.E., 12:15304
Li, Q., *See* Liu, N., 12:16581
Li, R., *See* Katzenstein, J., 12:17481
Libby, R.A., Different perspectives on the use of personal computers for technical analyses, 12:16449 (J;US)
Libman, V.A., *See* Litvinskij, L.L., 12:17252
Lichtman, S., Development of residual radioactivity criteria, 12:15490 (RA;US)
Lidsky, L.M., *See* Maneke, J.L., 12:16108
Lien, M.K., *See* Braby, L.A., 12:16865
Liepins, G.E., Representational issues in machine learning, 12:17641 (R;US)
Lierse, C., Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
Lietzke, A.F., H^- ion source scaling studies at LBL, 12:16566 (R;US)
Liew, S.L., TFTR basement radiation fluence calculations and comparisons with measurements, 12:17571 (J;US)
See Kolibal, J.G., 12:17525, 12:17553
Lim, E.C., Proximity effect in molecular photophysics: dynamical consequences of Pseudo-Jahn-Teller interaction, 12:16426 (J;US)
Lim, I.C., *See* Rhee, B.W., 12:16003
Lim, J.C., *See* Weisman, J., 12:15943
Lim, J.J., *See* Smith, S.T., 12:15565
Lin, C.D., An overview of low-energy ion-atom collisions, 12:17067 (R;US)
Atomic physics of strongly correlated systems: Progress report, 1 August 1984 through 31 July 1985, 12:17068 (R;US)
Lin, Y., *See* Liu, N., 12:16581
Lindau, I., *See* Bachrach, R.Z., 12:16570
Lindemuth, I.R., Computational modeling of plasma-flow switched foil implosions, 12:16496 (BA;US)
Lindfors, J., Higgs boson production by W and Z collisions, 12:17153 (R;FR)
Lindle, D.W., *See* Shirley, D.A., 12:16531
Lindley, D., More dimensions - Less inflation, 12:17393 (BA;US)
Linev, A.F., *See* Dem'yanov, A.V., 12:16512, 12:16562
Linford, R.K., *See* McKenna, K.F., 12:17474
See Tuszewski, M., 12:17473
Linn, S., *See* Barnard, J., 12:16798
Linney, E.O., *See* Curran, R.P., 12:15685
Lipartelliani, A.G., Problems of CP-violation in early unification theories, 12:17162 (R;SU)
Lipeles, R.A., Effects of hydrolysis on metallo-organic solution deposition of PZT [lead zirconate titanate] films, 12:16347 (R;US)
Lipkin, H.J., Tests of QCD in high energy spin reactions, 12:17123 (R;US)
Lipkin, J., *See* Bennett, R.H., 12:15450
Lipman, J.J., Studies of aluminum in rat brain, 12:16884 (R;US)
Lippel, P., *See* Fluss, M.J., 12:16307
Lippens, M., *See* Ehrlich, K., 12:16244
Lipschultz, C.A., *See* Ohki, K., 12:16806
Listvinsky, G., First wall and vacuum vessel analysis for Compact Ignition Tokamaks, 12:17507 (J;US)
See Wagner, C.E., 12:17500

Litovchenko, P.G., *See* Kirnas, I.G., 12:16645
Litvinskij, L.L., Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters, 12:17252 (R;SU;In Russian)
Liu, A.S., *See* Birtcher, R.C., 12:16262
Liu, C.T., Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
See McKamey, C.G., 12:16258
Liu, H.T., Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation, 12:16725 (R;US)
Liu, H.W., Grain boundary oxidation and fatigue crack growth at elevated temperatures. Final report, 12:16287 (R;US)
Liu, K.C., In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)
Liu, K.F., Research in theoretical nuclear physics: Annual report, 1985/1986, 12:17258 (R;US)
Liu, N., Compact synchrotron radiation source, 12:16581 (RA;US)
Liu, S.H., Effects of d-integral correlation on the mixed-valence properties of cerium systems: the integral-band problem, 12:16314 (J;US)
Liu, Y.C., *See* Auyang, L., 12:15277
See Chang, C., 12:16582
Liu, Y.S., Pin Power prediction in the Westinghouse Advanced Nodal Code, 12:15815 (J;US)
See Rathkopf, J.A., 12:15816
Liu, Z.H., *See* McMahan, M.A., 12:16650
Livet, J., Synthesis and structure of $[(UO_2)_8(N_3)_{16}O_2]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$, 12:16428 (R;FR)
Lobanov, Yu.Yu., *See* Zhidkov, E.P., 12:17380, 12:17381
Lobo, R., *See* Rodrigues, A.R.D., 12:16588
Lockwood, G.W., *See* Lutz, B.L., 12:16981
Locquet, J.P., Nature of coupling and dimensional crossover in superconducting multilayers, 12:17354 (R;US)
Loewen, T., Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
Logan, B.G., *See* Campbell, R.B., 12:17554
See Henning, C.D., 12:17499
Logunov, A.A., *See* Vlasov, A.A., 12:17362
Long, D.C., *See* Kniazewycz, B.G., 12:16011
Long, G.J., *See* Hanson, A.L., 12:16534
Long, R.S., Development of the load spectrum for the Westinghouse WWG-0600 wind turbine, 12:15661 (BA;US)
Loomis, B.A., *See* Knox, A.E., 12:16542
Loong, C.K., *See* Vrtis, M.L., 12:17339
Loper, G.D., *See* Smedskjaer, L.C., 12:16309
Lorencz, R., *See* Pivarc, J., 12:16509
Lorenz, A., Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986, 12:17196 (R;XA)
Lorenz, M., Computer codes for treatment of highly excited atomic states, 12:17660 (RA;DD;In German)
Lorenz, P.B., *See* Gao, H.W., 12:15358
Lorikyan, M.P., *See* Gavalyan, V.G., 12:16608
Lorrain, C., *See* Perinic, D., 12:17427
Los, J., Experimental studies on dissociative charge exchange, 12:17073 (RA;CS)
Loskutov, N.A., *See* Burtsev, V.A., 12:17414
Louis-Jacquet, M., Review of X-ray laser research at CEL-V, 12:16463 (R;FR)
See Combis, P., 12:17398
Louko, J., Propagator of quantum gravity in minisuperspace, 12:17387 (R;DK)
Lousteau, D.C., *See* Nelson, W.D., 12:17501
Lovchikova, G.N., Nuclear level density from analysis of neutron spectra from (n,n') and (p,n) reactions, 12:17277 (RA;CS)
Lowenfeld, S., *See* Gonzales, A.J., 12:15696
Lowenthal, D.D., *See* Harris, D.B., 12:17559
Lowndes, D.H., Time resolved studies of rapid solidification in highly undercooled molten silicon, 12:16368 (J;US)
See Jellison, G.E. Jr., 12:16369
See Wood, R.F., 12:16370
Loxton, C., *See* Hahn, H., 12:16249
Lu, C., Computer-based phosphoric acid fuel cell analytical tools - Descriptions and usages, 12:16194 (BA;US)
Lu, F., *See* Croft, M., 12:16303
Lu, J.Q., Beam dynamics calculations for the linac booster beam line, 12:16522 (R;US)
Lucas, G.E., Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)
Lucke, R.B., Characterization of metabolites and DNA adducts arising from direct coal liquids exposure, 12:15291 (RA;US)
Lucovsky, G., Amorphous materials and recrystallization, 12:16372 (BA;US)
Ludlam, T.W., *See* Beuttenmuller, R., 12:16660
Luk'yanov, S.M., *See* Will, E., 12:16629
Lukacs, B., *See* Bagoly, Zs., 12:16961
Luke, C.A., *See* Tice, R.R., 12:16900
Lumme, K., *See* Bowell, E.L.G., 12:16997
Lund, K.O., *See* Bogart, S.L., 12:17586
Lundsager, P., *See* Beurskens, J., 12:15648
Lundy, D., Processing of miscellaneous radioactive effluents by continuous flocculation decantation, 12:15426 (R;FR;In French)
Luo Anren, Economic efficiency of nuclear power in the People's Republic of China, 12:15887 (RA;XA)
Lusk, E.L., Automated reasoning and knowledge base design in the scientific programming environment, 12:17643 (R;US)
Lust, G., *See* Rank, D., 12:16791
Lutton, J.M., Decontamination process for hot leg LMFBR components, 12:15852 (RA;US)
Lutz, B.L., Outer planet studies, 12:16981 (RA;US)
See Baum, W.A., 12:16995
Lutz, G.R., First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)
See Whitley, R.H., 12:17504
Lutz, J.B., Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
See Harrell, J.R., 12:16104
Luxmoore, R.J., *See* Norby, R.J., 12:16908
Luzzi, T.E., Direct converter design for the MINIMARS Tandem Mirror Reactor, 12:17555 (J;US)
Lychagin, A.A., Measurement of inelastically scattering neutron spectra from the (n,n'γ) reaction on iron nuclei, 12:17213 (R;SU;In Russian)
See Anriashin, A.V., 12:16627
Lynch, G.J., On-line ion chromatography system, 12:16395 (R;US)
Lyneis, C.M., ECR [Electron Cyclotron Resonance] ion sources for cyclotrons, 12:16567 (R;US)
See McMahan, M.A., 12:16650
Lynn, K.G., *See* Nielsen, B., 12:16308
See Snead, C.L. Jr., 12:16311
See Usmar, S.G., 12:16240
Lynt, R., *See* Beck, W.L., 12:15547
Lyons, W.M., National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983, 12:16210 (R;US)

M

Ma, C.Y., *See* Griest, W.H., 12:16887
Maan, M.A., Establishing a comprehensive cost-effective radiological protection program for decommissioning project, 12:16009 (RA;US)
Macdonald, D.D., *See* Paddock, R.A., 12:16237
Macduff, R., *See* Sedaghat, A., 12:15942
Macey, D.J., A calibration phantom for absolute quantitation of radionuclide uptake by SPECT, 12:16819 (J;US)
See De Nardo, G.L., 12:16820
MacGregor, R.R., *See* Arnett, C.D., 12:16816
Mackay, G.H., Characterisation of insoluble residues from the hydrogenation of Victorian brown coals, 12:15307 (R;AU)
MacKenzie, D.R., *See* Siskind, B., 12:15439
Macko, S.A., *See* Walsh, J.J., 12:16786
Madell, J.T., Special simulation programs generated by DSNP for educational uses, 12:15934 (J;US)
Mader, W., Lattice imaging study of grain boundaries at normal incidence to the boundary plane, 12:16267 (R;US)
Maerten, H., Differential study of /sup 252/Cf(sf) neutron emission, 12:17245 (RA;CS)
Theoretical study of the /sup 252/Cf(sf) neutron spectrum, 12:17281 (RA;CS)
Maffei, H.P., *See* Lutton, J.M., 12:15852
Magee, N.H. Jr., Opacity calculations for laser plasma applications, 12:17411 (R;US)

Magelssen, G.R., Gain scaling relations for heavy-ion targets, 12:17617 (J;US)
Magradze, N.V., *See* Akopova, A.B., 12:16607
Maguire, W.C., *See* Jennings, D.E., 12:16977
Mahajan, D., *See* O'Hare, T.E., 12:15587, 12:15588, 12:15589
Mahannah, J.A., PPC - an interactive preprocessor/compiler for the DSNP simulation language, 12:15932 (J;US)
Mahlum, D.D., Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)
Initiation-promotion studies with complex mixtures, 12:15341 (RA;US)
See Springer, D.L., 12:15338, 12:15339
See Wright, C.W., 12:15295
Maida, M., *See* Draper, J.V., 12:16453
Mailen, J.C., Americium product solidification and disposal, 12:15441 (R;US)
How well does ORIGEN predict spent LWR [Light Water Reactor] fuel characteristics, 12:15416 (R;US)
Mainka, E., *See* Coerdt, W., 12:16430
Maiya, P.S., *See* Kassner, T.F., 12:15766
See Shack, W.J., 12:15764
Majid, A., Design window for liquid metal-cooled limiters, 12:17578 (J;US)
Majumdar, S., *See* Picologlou, B.F., 12:17520
Makarovskij, P.I., *See* Zemlyanukhin, V.V., 12:16032
Makdisi, Y.I., Experimental results on spin physics at the AGS, 12:17096 (R;US)
Makenas, B.J., Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
Mal'tsev, I.G., HF-field stabilization in the booster injector debuncher, 12:16552 (R;SU;In Russian)
Malcher, L., HDR [Heissdampfreaktor] Phase 2 vibrational experiments, 12:16020 (R;US)
Malen, K., Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
Malinovic, B., Passive decay heat removal in liquid-metal cooled reactors, 12:17548 (J;US)
Mallinson, R.G., *See* Starling, K.E., 12:15304
Malmberg, T., Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)
Malone, R.C., *See* Pitcher, E.J., 12:16699
Malony, A.D., *See* Abu-Sufah, W., 12:17663
Malterre, G., *See* Eymery, R.P., 12:15395
Maltrud, M., *See* Dembo, M., 12:16802
Malvezzi, A.M., *See* Steinbeck, J., 12:17352
Maly, M., *See* Butenko, V.A., 12:16630
Man'ko, V.I., *See* Leznov, A.N., 12:17364
Mancuso, T.A., *See* Gurol, H., 12:17607
Mandler, R., *See* Blank, H., 12:15378
Maneke, J.L., MHTGR confinement radiation releases, 12:16108 (J;US)
Manhardt, A.E., *See* Ruddy, F.H., 12:15951
Mani, K.V., *See* Wehring, B.W., 12:16662
Mann, D.L., *See* Bean, R.M., 12:16896
Mann, G.M.W., Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Mannava, S.R., Laser doppler measurement of torsional vibrations, 12:15705 (RA;US)
Manokhin, V.N., *See* Kuz'minov, B.D., 12:17244
Manson, S.T., *See* DuBois, R.D., 12:17319
See Miller, J.H., 12:17317
See Toburen, L.H., 12:17314
Mansoori, G.A., *See* Benmekki, E.H., 12:15359
See Du, P.C., 12:15364
Maor, D., *See* Schoenfeldt, W.A., 12:17071
March-Leuba, J., A reduced-order model of boiling water reactor linear dynamics, 12:15776 (J;US)
Marchant, L.C., *See* Westhoff, J.D., 12:15371
Marchetti, S., Decommissioning the world's first commercial nuclear fuel reprocessing facility, 12:15558 (RA;US)
Radioactive waste assay at the West Valley Demonstration Project, 12:15529 (RA;US)
Marchok, A.C., Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
Marencak, M., Spectrometry and in core dosimetry of neutron radiation. Part I. Invited papers, 12:16619 (R;CS;In Czech)
Marest, G., *See* Moncoffre, N., 12:16286
Margaryan, A.J., *See* Bayatyan, G.L., 12:17102
Margolin, L.G., A diffusion operator for Lagrangian meshes, 12:17659 (R;US)
Margolis, S.H., Ultraheavy cosmic rays: Propagation and selective acceleration, 12:16936 (RA;US)
See Blake, J.B., 12:16935, 12:16937
Marianski, B., *See* Rondio, J., 12:17221
Marino, G., *See* Khatib-Rahbar, M., 12:16102
Markaryan, Eh.R., *See* Bagdasaryan, D.S., 12:16548, 12:16605
Marklin, G., Equilibrium of the kink source experiment, 12:17456 (RA;US)
See Hoida, H.W., 12:17450
Marklin, G.J., *See* Barnes, C.W., 12:17449
See Jarboe, T.R., 12:17451
See Knox, S.O., 12:17448
Markoff, D., Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Markowski, E.S., *See* Borchers, W.A., 12:15918
Marks, S., *See* Denham, D.H., 12:15442
Markuszewski, R., *See* McGowan, C.W., 12:15374
Marland, G., *See* Rotty, R.M., 12:16757
Marschke, S.F., *See* Pon, W.D., 12:17328
Marshall, B.W. Jr., An experimental study of isothermal and boiling liquid jets, 12:16062 (R;US)
Marshall, R., Electroweak interactions and new particle searches, 12:17135 (RA;CS)
Martin, J., *See* Drake, J., 12:15622
Martin, J.B., *See* Merwin, S.E., 12:17333
Martin, M.R., *See* McCardell, R.K., 12:16025
Martinelli, G., Hadron spectroscopy using Monte Carlo technique in lattice gauge theory, 12:17141 (RA;CS)
Martino, J., Measurement of the muon capture rate in liquid deuterium by the lifetime technique, 12:17204 (R;FR)
Martynova, A.A., *See* Zemlyanukhin, V.V., 12:16032
Martz, A., *See* Geist, P., 12:16602
Marx, G., Thermodynamics of the Universe, 12:16955 (RA;CS)
Maryland, C., *See* McNees, J.L., 12:15559
Mascureau, J. de, *See* Bourgade, J.L., 12:17397
Mason, D.M., *See* Carty, R.H., 12:15271
Masopust, R., Earthquake resistance problems of electric equipment, 12:16042 (RA;CS;In Czech)
Earthquake resistance of liquid-filled thin-walled cylindrical tanks, 12:16047 (RA;CS;In Czech)
Effect of extreme forces on structures and equipment of nuclear power plants, 12:16044 (RA;CS;In Czech)
Massey, J.V., Impact of high-burnup fuel cycles on fuel storage systems, 12:15808 (J;US)
Massey, M.J., *See* Gray, R.H., 12:15340
Massoud, M., An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)
Masuda, J., Improvement in steam generator level control, 12:15817 (J;US)
Masuzawa, M., *See* Fukui, Y., 12:16611
Matevosyan, V.Kh., *See* Akopov, N.Z., 12:16609
Matheson, J.E., Application of high-burnup experience to consolidation equipment design, 12:15782 (J;US)
Mathews, M.A., Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Mathiot, A., Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme, 12:16034 (R;FR)
Matijevic, E., Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
Matinyan, S.G., *See* Alanakyan, R.A., 12:17129
Matos, J.E., Effect of changes in DOE pricing policies for enrichment and reprocessing on research reactor fuel cycle costs, 12:15869 (R;US)
Matousek, V., *See* Pivarc, J., 12:16509
Matson, D.L., Asteroid team, 12:17009 (RA;US)
Matsumoto, H., *See* Tsurutani, B.T., 12:16967
Matsumoto, T., *See* Takei, K., 12:15783
Mattas, R.F., *See* Finn, P.A., 12:17539
Matton, P., *See* Lundy, D., 12:15426
Mattox, G.C., Informing the educators: one of the keys to public acceptance, 12:16164 (J;US)
Matusevich, E.S., *See* Bezhunov, G.M., 12:17309
Matveev, V.A., Bag model from the preons, 12:17150 (R;SU;In Russian)
Matzke, H., *See* Blank, H., 12:15378

Mauderly, J.L., Responses of the respiratory tract to inhaled particle-organic mixtures, 12:16893 (RA;US)
See Wolff, R.K., 12:16894
Max, N.L., Light diffusion through clouds and haze, 12:16698 (J;US)
Mayhall, J.A., *See* Brown, T.G., 12:17494
Maynard, C.W., *See* Watanabe, Y., 12:17593
Mazzi, G., *See* Della Mea, G., 12:16349
McAnally, M.A., *See* Salomon, J.H., 12:15691
McArthur, D.A., *See* Rice, J.K., 12:16467
McBeth, R.L., *See* Winans, R.E., 12:15300
McCall, M.J., Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)
McCardell, R.K., Preliminary results of the TMI-2 core bores, 12:16025 (R;US)
McCarthy, D., *See* Burwell, C.C., 12:16219
McCarthy, J., *See* Shugart, L., 12:16892
McCarty, J.G., Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
McCarville, T.J., SAFIRE - A systems analysis code for inertial fusion economics, 12:17591 (J;US)
McClellan, R.O., *See* Bond, J.A., 12:16890
See Mauderly, J.L., 12:16893
See Mitchell, C.E., 12:16897
McClendon, R.E., Permitting windfarms in California: Environmental impacts, local regulations, developer responsibility, 12:15643 (BA;US)
McCloskey, T.H., *See* Hurwitz, M.J., 12:15693
McClung, R.W., *See* Cook, K.V., 12:15763
McCollor, D.P., *See* Young, B.C., 12:15332
Mccord, T.B., Research in planetary astronomy, 12:16970 (RA;US)
McCormick, P., *See* Drake, J., 12:15622
McCray, J.G., Site characterization field manual for near surface geologic disposal of low-level radioactive waste, 12:15422 (R;US)
McCubbin, N.A., Hadronic production of leptons and photons, 12:17137 (RA;CS)
McDanal, M.W., FERC perspectives on nuclear fuel accounting issues, 12:15566 (J;US)
McDaniel, E.E., *See* Tallent, O.K., 12:15469
McDaniel, E.W., Quality assurance consideration for cement-based grout technology programs at Oak Ridge National Laboratory, 12:15414 (R;US)
McDermott, K.J., Tomorrow's mobile robots in today's nuclear power plants, 12:16131 (J;US)
McDonald, J.C., Technical guidelines for radiological calibrations, 12:16874 (RA;US)
See Faust, L.G., 12:16875
See Wilson, W.E., 12:17324
McDougall, M.R., *See* Beck, W.L., 12:15547
McElroy, J.W., Acoustic leak detection in nuclear power plants, 12:15945 (RA;US)
Mcfadden, L.A., Planet-crossing asteroids: interrelationships within the solar system, 12:17010 (RA;US)
McGarry, J.J., *See* Kreider, K.A., 12:16130
McGhee, D.G., *See* Turner, L.R., 12:17528
McGhee, S.D., *See* Kunze, J.F., 12:17537
McGill, J.A., *See* Morris, C.L., 12:17212
McGinnis, C.P., Operation of a radiochemical uranium nitrate solidification facility, 12:15485 (J;US)
McGinniss, M.J., *See* Albertini, R.J., 12:16898
McGowan, C.W., Identification of organic compounds in the bitumen of Chattanooga oil shale, 12:15374 (J;US)
McGrath, D.A., *See* Williams, R.E., 12:15418
McGraw, J.R., Computer science research: Computation directorate, 12:17657 (R;US)
McHargue, C.J., *See* Farlow, G.C., 12:16341
McKamey, C.G., Effect of aluminum addition on ductility and yield strength of Fe_3Al alloys with 0.5 wt % TiB_2, 12:16258 (R;US)
McKenna, J.D., *See* Greiner, G.P., 12:16717
McKenna, K.F., Proposed FRX-D experiment, 12:17474 (RA;US)
See Armstrong, W.T., 12:17470
See Fernandez, J.C., 12:17452
See Rej, D.J., 12:17469
See Tuszewski, M., 12:17473
McLaughlin, T.J., *See* Kennedy, W.E. Jr., 12:15443
McLean, J.E., Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
McLeod, P.S., *See* Cape, J.A., 12:15614
McMahan, M.A., Using a cyclotron plus ECR source for detector evaluation and calibration, 12:16650 (J;NL)
McMullen, A.K., *See* Chamberlain, L.R., 12:16409
McNabb, K.E., Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)
McNees, J.L., Final resting place of a cesium 137 gauge, 12:15559 (RA;US)
McNeill, H., Equipment and procedural modifications to improve the reliability of Terry turbines used in nuclear service, 12:15785 (J;US)
McVay, C.W., *See* Marchetti, S., 12:15529
McWright, G.M., Integrated optical devices for high speed diagnostics, 12:16493 (R;US)
Meador, S., Regulation of surface subsidence in West Virginia, 12:15346 (BA;US)
Meadows, G.E., *See* Bechtold, R.A., 12:15984
Meadows, J.W., *See* Smith, D.L., 12:17256
Mecholsky, J.J., *See* Freiman, S.W., 12:16338
Medford, G.T., Identification of test candidates for investigating the survivability of electrical equipment during severe accidents, 12:16120 (J;US)
Meehl, G.A., *See* Washington, W.M., 12:16738
Meher-Homji, C.B., *See* Boyce, M.P., 12:15689
Mehta, H.S., Application of the leak-before-break approach to BWR piping: Final report, 12:16029 (R;US)
Meier, J.V., *See* Barnes, N.P., 12:16469
Meier, U., *See* Jalby, W., 12:17669
Meier, W.R., A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
See McCarville, T.J., 12:17591
See Pendergrass, J.H., 12:17618
See Tobin, M.T., 12:17560
Meieran, H.B., Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario, 12:16073 (J;US)
Meinecke, W., *See* Becker, M., 12:15618
Meininger, R.D., *See* Phelps, R.L. Jr., 12:15821
Meinken, G.E., *See* Som, P., 12:16824
Meister, A., Chemical shifts of uranium neutron resonances, 12:17251 (RA;CS)
See Ignatovich, V.K., 12:17230
Melchior, D., *See* Langmuir, D., 12:15350
Melczer, M.E., *See* Croft, M., 12:16303
Melhem, Toward efficient implementations of PCCG (preconditioned conjugate gradient) methods on vector supercomputers. Technical report, 12:17639 (R;US)
Melikov, G.I., *See* Arutyunyan, V.N., 12:16546
Meliksetian, A., *See* Liu, Y.S., 12:15815
Men'shikov, A.L., *See* Butenko, V.A., 12:16630
Mendenhall, M., *See* Della Mea, G., 12:16349
Meneghetti, D., Comparisons of PRD [power-reactivity-decrements] components for various EBR-II configurations, 12:15974 (R;US)
Delineations of power and power-to-flow feedback components of EBR-II, 12:15863 (J;US)
See Grimm, K.N., 12:15931, 12:15973
Meneley, D.A., *See* Mesman, L.M., 12:15935
Meneses, A., New results obtained by the number theoretical description of the level densities of nuclei, 12:17270 (RA;CS)
Menicucci, D.F., PVFORM Version 3.2: a PV simulation program for mini and micro computer systems. Second version, 12:15617 (R;US)
Menietti, J.D., Modeling and investigative studies of Jovian low frequency emissions, 12:16982 (RA;US)
Menlove, H., *See* Enssling, N., 12:16663
Menlove, H.O., Field test and calibration of neutron coincidence counters for high-mass plutonium samples, 12:16647 (R;US)
Mensinger, M.C., *See* Rue, D.M., 12:15274
Merchant, D.J., Post-accident recovery operations at TMI-2, 12:16010 (RA;US)
Meriwether, G.H., Development and applications of core simulation for the Hanford N Reactor, 12:15841 (J;US)
Merker, M., *See* Barlow, T.A., 12:17326
Merlo, C.A., Hyperfiltration of tomato juice: pilot plant scale high temperature testing, 12:16853 (J;US)

Hyperfiltration of tomato juice during long term high temperature testing, 12:16854 (J;US)
Meron, M., *See* Johnson, B.M., 12:17058
See Jones, K.W., 12:16533
Merry-Libby, P., *See* Wang, J., 12:15516
Merson, T.J., *See* Norris, A.E., 12:16918
Merwin, S.E., Two example applications of optimization techniques to radiation protection programmes of United States Department of Energy Contractors, 12:17333 (BA;XA)
Mesman, L.M., Input and control management scheme for the DSNP simulation language, 12:15935 (J;US)
Mestdagh, J.M., Differential cross-sections of fine structure transitions in K (4P) - He, Ar collisions, 12:17063 (R;FR)
Mestel, L., Axisymmetric pulsar magnetosphere, 12:16951 (RA;CS)
Metrevell, Z.V., *See* Baldin, A.M., 12:17201
Metting, N.F., Dose-rate evidence for two kinds of radiation damage in stationary-phase mammalian cells, 12:16866 (RA;US)
Measurement of energy deposition near heavy ion tracks, 12:17320 (RA;US)
Survival of subpopulations of plateau-phase Chinese hamster ovary (CHO) cells selected by size, 12:16868 (RA;US)
See Braby, L.A., 12:17323
See Nelson, J.M., 12:16799, 12:16815, 12:16867
Meulemeester, F.M. de, Operation and utilization of the Argonaut type low flux reactor, 12:15991 (RA;XA)
Meyer, B.A., Deconning during the 1984 H.B. Robinson steam generator replacement project, 12:15523 (RA;US)
Meyer, G.A., *See* Jones, J.H., 12:15835
Meyer, H., Biomass partial gasification. Final report, 12:15584 (R;DE;In German)
See De Bievre, P., 12:16389
Meyer, H.R., Public information experience in the uranium mill tailings remedial action (UMTRA) project, 12:15510 (RA;US)
See Skinner, D.J., 12:15514
Meyer, P., *See* Howell, R.H., 12:16312
Meyer, P.J., Nuclear power costs in developing countries, 12:15885 (RA;XA)
Risk assessment from point of view of supplier, 12:15893 (RA;XA)
Meyer, W.T., *See* Breakstone, A., 12:17121
Meyerhofer, D.D., Methods for examining the particle and energy confinement in S-1, 12:17442 (RA;US)
See Ellis, R. Jr., 12:17439
See Levinton, F.M., 12:17444
See Mimura, M., 12:17445
See Paul, S.F., 12:17443
Michalske, T.A., *See* Bunker, B.C., 12:16365
Micklich, B.J., Fast and intermediate energy neutron albedos for fusion materials, 12:17623 (J;US)
See Kislev, H., 12:17561
Midkiff, S.P., Compiler generated synchronization for DO loops, 12:17664 (BA;US)
Miedaner, A., *See* DuBois, D.L., 12:16421
Miehe, J.A., *See* Geist, P., 12:16602
Mignerey, A.C., *See* McMahan, M.A., 12:16650
Mikhajlov, I.N., *See* Bal'butsev, E.B., 12:17295
Mikah, A., *See* Butenko, V.A., 12:16630
Mil'shin, V.I., *See* Andriashin, A.V., 12:16671
Milakovic, J., Portable wide range instrument for beta radiation monitoring with minimum angular dependence, 12:16598 (RA;US)
Miles, R.F. Jr., The SIMRAND I computer program: Simulation of research and development projects, 12:17647 (R;US)
Milewski, A.J., The Solid Waste Transfer Pit an FFTF [Fast Flux Test Facility] station for fuel and reflector transfer, 12:15983 (R;US)
Miley, D.V., Microstructural response of rapidly solidified 304 stainless steel powder to three consolidation techniques, 12:16269 (R;US)
Miley, G.H., MHD energy conversion with advanced-fuel ion beam fusion, 12:17567 (J;US)
See Carroll, M.C., 12:17517
See Ho, S.K., 12:17419
See Kislev, H., 12:17569
Milham, R.C., *See* Weber, A.H., 12:16769
Milian, L.W., *See* Piciulo, P.L., 12:15408
Millener, D.J., First forbidden beta decay in light nuclei, 12:17303 (BA;US)
Miller, C.A., *See* Philippacopoulos, A.J., 12:16005
Miller, C.E., Decommissioning planning and the assessment of alternatives for the Hanford production reactors, 12:15502 (RA;US)
Miller, C.E. Jr., Overview of the surplus facilities management program, 12:15542 (RA;US)
Miller, C.H., *See* Holladay, D.W., 12:15534
Miller, C.W., Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS, 12:15505 (RA;US)
Miller, G.D., Multipurpose prompt gamma facility, 12:15581 (J;US)
Miller, H.C., A bibliography and author index for electrical discharges in vacuum (1897-1984), 12:15667 (R;US)
Miller, J., *See* Hung, C.C., 12:16360
See Koenig, J.L., 12:15604
Miller, J.F., Batteries for hybrid vehicles or other high-power applications, 12:16234 (R;US)
Miller, J.H., Effects of phase on differential ionization cross sections, 12:17321 (RA;US)
Ion yields in liquid water, 12:17322 (RA;US)
Stochastic repair-misrepair model, 12:16870 (RA;US)
Theoretical cross sections for ionization structured ions, 12:17317 (RA;US)
Theoretical single differential cross sections for bare ions, 12:17315 (RA;US)
Miller, J.R., High field superconducting magnets (12 T and greater) for fusion applications, 12:17606 (J;US)
See Henning, C.D., 12:17499
Miller, L.D., *See* Auerbach, N., 12:17300
Miller, R.A., *See* Springer, D.L., 12:15339
Miller, R.L., Advanced tokamak reactors based on the spherical torus (ATR/ST), 12:17502 (J;US)
Fusion reactor options and alternatives for the RFP, 12:17503 (J;US)
Miller, S.J., *See* Laudal, D.L., 12:15748
Miller, T., Adsorption of Ag on Ge(100)-(2 x 1), 12:16315 (J;GB)
Miller, W.E., *See* Burris, L., 12:15383
See Wolson, R.D., 12:15384
Millis, R.L., *See* Baum, W.A., 12:16995
Mills, D.M., *See* Tischler, J.Z., 12:16306
Mills, M., *See* Burwell, C.C., 12:16219
Mills, W.J., Fracture toughness of stainless steel welds, 12:16278 (R;US)
Milroy, R.D., Spontaneous generation of toroidal magnetic field during spheromak formation in a conical Theta-pinch, 12:17461 (RA;US)
See Armstrong, W.T., 12:17470
See Hoffman, A.L., 12:17464
See Slough, J.T., 12:17463
Mimura, M., Initial VUV spectroscopy results from S-1 spheromak, 12:17445 (RA;US)
See Ellis, R. Jr., 12:17439
See Meyerhofer, D.D., 12:17442
Mis'ko, J.V., *See* Anriashin, A.V., 12:16627
Minh, N.Q., *See* Smith, J.L., 12:16189, 12:16190
Minkov, V., Design and economics of large fuel cell power plants, 12:16188 (R;US)
Minkova, A., *See* Inoyatov, A.Kh., 12:16636
Miquel, J.L., *See* Bourgade, J.L., 12:17397
Mirin, A.A., Multimode evolution of the decaying spheromak, 12:17460 (RA;US)
The Computational Physics Program of the National MFE Computer Center, 12:17417 (R;US)
Mironov, A.N., *See* Anriashin, A.V., 12:16627
Mirzadeh, S., Studies of the chemical behavior of carrier-free /sup 68/Ge. Pt. 3. Adsorptive properties, 12:16432 (J;DE)
Mirzoev, F.Kh., To the theory of radiation-induced pores in crystals, 12:16279 (RA;SU;In Russian)
Mishina, M., *See* Fukui, Y., 12:16611
Miskimin, P.A., Optimized application of systems engineering to nuclear waste repository projects, 12:15471 (J;US)
Miskowski, V.M., *See* Hopkins, M.D., 12:16410
Mitchell, C.E., In vivo interactions of chemical mixtures with DNA, 12:16897 (RA;US)
See Brooks, A.L., 12:16901
See Wolff, R.K., 12:16894
Mitrofanov, V.F., *See* Goverdovskij, A.A., 12:17248
Mittag, S., *See* Ignatovich, V.K., 12:17230
See Meister, A., 12:17251
Mix, A.C., Structure and timing of the last deglaciation: oxygen-isotope evidence, 12:16922 (J;GB)
Miyashita, S., *See* Fukui, Y., 12:16611
Miyata, H., *See* Fukui, Y., 12:16611
Mizuno, T., Fossil plant water chemistry in Japan, 12:15729 (RA;US)
Mkrtchyan, G.G., *See* Bagdasaryan, D.S., 12:16548, 12:16605
Mnukova, J., *See* Hanis, T., 12:16846
Modera, M.P., *See* Diamond, R.C., 12:16203
Modine, F.A., *See* Abraham, M.M., 12:16343

Moe, H.J. Robinet, M.J., *See* Wynveen, R.A., 12:15495
Mogilevskij, O.A., *See* Gorenshtejn, M.I., 12:17169
Mohaupt, T.H., *See* Vesper, B.E., 12:15521, 12:15528
Moieni, P., *See* Spurgin, A.J., 12:16068
Moir, R.W., Helium-cooled, FLiBe-breeder, beryllium-multiplier blanket for MINIMARS, 12:17513 (J;US)
Moiseenko, A.A., *See* Akopova, A.B., 12:16607
Mokhov, N.V., *See* Bajshev, I.S., 12:16616
Mokler, P.H., *See* Schoenfeldt, W.A., 12:17071
Mokrov, Yu.V., *See* Buchnev, V.N., 12:16641
Molello, S.A., Use of site groundwater investigations in the decontamination and decommissioning of nuclear facilities, 12:15512 (RA;US)
Molnar, G., *See* Wang, W.C., 12:16760
Momin, A.C., Water Chemistry Division Progress Report, April 1983-April 1985, 12:16399 (R;IN)
Moncoffre, N., Temperature influence during nitrogen implantation into steel, 12:16286 (R;FR)
Monich, V.A., *See* Liparteliani, A.G., 12:17162
Montanari, P., *See* Giaquinto, L., 12:15659
Monteleone, D.C., *See* Freeman, S.E., 12:16882
Montes Ponce de Leone, J., Interregional technical co-operation project on small and medium power reactors, 12:15880 (RA;XA)
Montgomery, D.B., *See* Beck, W.K., 12:17608
Moog, E.R., *See* Bader, S.D., 12:16254
Moon, F.C., *See* Hara, K., 12:17610
Moore, B. III, Calibrating ocean models by the constrained inverse method, 12:16784 (BA;US)
Moore, C.F., *See* Morris, C.L., 12:17212
Moore, F.W., Optical fiber inspection system, 12:16676 (P;US)
See Bowen, W.W., 12:15377
Moore, R.E., *See* Till, J.E., 12:15508
Moore, T.I., *See* Shugars, H.G., 12:15684
Morales Galvan Duque, L., *See* Tapia Garcia, F., 12:15892
Mordashev, V.M., *See* Zemlyanukhin, V.V., 12:16032
Mordenti, P., *See* Gauchon, J.P., 12:15772
Morel, J., *See* Perez-Mendez, V., 12:16655
Moreschi, J.R., *See* Smith, J.L., 12:16190
Moretto, L.G., *See* McMahan, M.A., 12:16650
Morford, R.J., Neutron shields for medium-energy accelerators, 12:16518 (J;US)
Morgan, C.D., Use of the Chen boiling heat transfer correlation in once-through steam generator analysis, 12:16089 (J;US)
See Hassan, Y.A., 12:16087
Mori, S., *See* Fukui, Y., 12:16611
Mori, T., *See* Youssef, M., 12:17589
See Youssef, M.Z., 12:17509
Morin, S.J., National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980, 12:16213 (R;US)
Morozov, A.A., *See* Solyany, V.I., 12:15797
Morozov, V.A., *See* Abrosimov, V.N., 12:16632
Morris, C.L., Observation of energetic protons in coincidence with pion-induced double charge exchange on / sup 12/C and /sup 48/Ca, 12:17212 (J;NL)
Morris, D.J., *See* Stevens, D.M., 12:15946, 12:15947
Morris, J.W. Jr., Advanced metal alloys for energy needs, 12:16319 (BA;US)
Morris, M.D., *See* Jones, T.D., 12:16859
Morrison, D., *See* Hall, D.N.B., 12:16976
Morrison, J.E., *See* Bennett, P.R., 12:15480
Morse, E.C., *See* Tobin, M.T., 12:17560
Moses, G.A., *See* Bartel, T.J., 12:17566
See Pong, L.C., 12:16143
Mosley, R.B., Advanced ESFF laboratory test results, 12:15741 (RA;US)
See Yamamoto, T., 12:15740
Mosnier, A., Feedback system analysis for beam breakup in a multipass multisection electron linac, 12:16507 (R;FR)
Mostafa, M., *See* Zaghloul, R., 12:16391
Mostefai, M., Formation and decay of hot nuclei, 12:17241 (R;FR)
Mott, J.E., EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software, 12:15976 (R;US)
See Crellin, G.L., 12:15919
Moussin, C., *See* Praca, C., 12:15409
Mrazek, F.C., *See* Dees, D.W., 12:16191
Mucci, J., *See* Weeks, N.L., 12:16289
Mudrolyubov, V.G., *See* Bel'skij, N.P., 12:16515
Muehlstein, L.K., Sheath pigment formation in a blue-green algae lyngbya aestuarii as an adaptation to high light, 12:16832 (RA;US)
Muelhaupt, G., Berlin Electron Storage Ring BESSY: a dedicated XUV synchrotron radiation facility, 12:16573 (RA;US)
Mueller, C.J., Impacts of reactivity feedback uncertainties on inherent shutdown in innovative designs, 12:16076 (J;US)
Mueller, D.E., *See* Simmons, R.L., 12:15956
Mueller, E.R., Evolution of radiation power profiles in ASDEX H-mode discharges, 12:17407 (R;DE)
Mueller, N.P., Backfit of advanced technology to improve plant operability and maneuverability, 12:15964 (J;US)
Mueller-Vonmoos, M., Long-term stability of bentonite under repository conditions, 12:15433 (R;CH;In German)
Muhleman, D.O., Lunar and planetary studies, 12:16984 (RA;US)
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Muhlestein, L.D., *See* Jeppson, D.W., 12:17549
Muir, D.W., COVFILS-2: Neutron data and covariances for sensitivity and uncertainty analysis, 12:17622 (J;US)
The evaluation and application of redundant-cross-section covariances, 12:17202 (R;US)
Muleski, G.E., Measurement of fugitive emissions in a coal-fired power plant, 12:15753 (RA;US)
Mulik, P.R., *See* Bachovchin, D.M., 12:15276
Mumma, M.J., Advanced infrared astronomy, 12:16971 (RA;US)
See Deming, D., 12:17019
Mundy, J.N., Vacancy migration enthalpy in tungsten at high temperatures, 12:16252 (R;US)
See Siegel, R.W., 12:16248
Munoz, C., *See* Gauchon, J.P., 12:15772
Munson, L.F., Hanford defense mission: Past, present and future, 12:17631 (R;US)
Murakami, S., *See* Fukushi, S., 12:15908
Murdoch, A., *See* Price, W.W., 12:16174
Murphy, C.E. Jr., Carbon dioxide exchange and growth of a pine plantation, 12:16809 (J;NL)
Murphy, G.L., Decontamination of an Americium-241 site, 12:15552 (RA;US)
Murphy, J.B., Collective instability of a free electron laser including space charge and harmonics, 12:16468 (J;NL)
Murphy, M., *See* Gal, E., 12:15752
Murty, A.N., A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Murzin, A.V., *See* Litvinskij, L.L., 12:17252
Musgrove, J.G., Performance improvement history of inadequately performing precipitators, 12:15751 (RA;US)
See Samuel, E.A., 12:15745
Musicki, Z., *See* Watanabe, Y., 12:17593
Musienko, Yu.V., *See* Denisov, D.S., 12:16617
Musikas, C., *See* Livet, J., 12:16428
Muzumdar, A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Myer, L.R., *See* King, M.S., 12:16926
Myers, P.M., *See* Hoovler, G.S., 12:16067

N

Naday, I., *See* Strauss, M.G., 12:16600
Nagaenko, M.G., TOREX program for calculating aberration coefficients of magnetooptical systems, 12:16530 (R;SU;In Russian)
Nagaev, V.I., *See* Mal'tsev, I.G., 12:16552
Nagle, N., *See* Barclay, W., 12:15613
Nagy, K.A., *See* Goldstein, D.L., 12:16843
Nair, R.P., *See* Maan, M.A., 12:16009
Nakagawa, M., Issues and test requirements in radiation shielding of fusion reactors, 12:17532 (J;US)
See Youssef, M., 12:17589
See Youssef, M.Z., 12:17509
Nakamura, T., Summary of recent results from the JAERI/U.S. Fusion Neutronics Phase I Experiments, 12:17508 (J;US)
See Youssef, M.Z., 12:17509
Namboodiri, M.N., *See* McMahan, M.A., 12:16650

Nandy, F.R., Nuclear rate regulation, 12:15914 (J;US)
Nanjundeswaran, K., *See* Joshi, N.B., 12:16035
Napier, B.A., *See* Gilbert, T.L., 12:15494
See Hawley, K.A., 12:15444
See Kennedy, W.E. Jr., 12:15492
Napper, P.R., *See* Harker, Y.D., 12:16923
Narayan, J., Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
See Lucovsky, G., 12:16372
See Pennycook, S.J., 12:16364
Narodetskij, I.M., *See* Kalashnikova, Yu.S., 12:17287
Nasise, J.E., Residual tritiated water in molecular sieves, 12:17545 (J;US)
Nauenberg, U., *See* Atwood, W.B., 12:16658
Navrotskij, M.A., *See* Levashev, V.P., 12:17370
Navrotsky, A., *See* Wright, D.P., 12:16931
See Ziegler, D., 12:16927
Neal, D.R., *See* Rice, J.K., 12:16467
Nechaeva, L.P., *See* Barit, I.Ya., 12:16558
Necker, G., *See* Mader, W., 12:16267
Negas, T., *See* Abraham, M.M., 12:16343
Negin, C.A., MICROSHIELD - a microcomputer program for analyzing dose rate and gamma shielding, 12:16114 (J;US)
Neill, D.R., Progress and problems in wind energy research and development in Hawaii, 12:15647 (BA;US)
Nelson, D.B., Supercomputers and magnetic fusion energy, 12:17624 (BA;US)
Nelson, J.K., *See* Burrage, L.M., 12:15668
Nelson, J.M., Flow-cytometric analysis of plateau-phase mammalian cell populations, 12:16799 (RA;US)
Kinetic differences between fed and starved Chinese hamster ovary cells, 12:16815 (RA;US)
Sublethal damage is not the same as potentially lethal damage, 12:16867 (RA;US)
See Braby, L.A., 12:16864, 12:16865
See Metting, N.F., 12:16866, 12:16868
Nelson, J.V., *See* Campbell, L.R., 12:15861
Nelson, P.A., Lithium alloy/iron sulfide batteries, 12:16150 (BA;US)
Nelson, W.D., The final version of MINIMARS--An engineering view, 12:17501 (J;US)
Nelson, W.R., Properties of the EM cascade: A tutorial utilizing high resolution 3D color graphics, 12:17325 (R;US)
See Jenkins, T.M., 12:16516
Nemethy, P., *See* Oddone, P., 12:16654
Nesterenko, V.O., Basic equations of the quasiparticle-phonon nuclear model for deformed even-even nuclei, 12:17296 (R;SU;In Russian)
Nesterenko, V.S., *See* Anriashin, A.V., 12:16627
Neuberger, H., Thirring strings, 12:17184 (J;NL)
Neubert, D., *See* Maerten, H., 12:17245
Neuman, R.D., Laser light-scattering and laser fluorescence studies of solvent extraction systems, 12:16384 (R;US)
Nevins, W.M., *See* Ho, S.K., 12:17419
Nevitt, M.V., The elastic properties of LaNbO/sub 4/, 12:16340 (BA;US)
Newburn, R.L. Jr., Physical processes in comets, 12:17011 (RA;US)
Newman, C.N., Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells, 12:16869 (RA;US)
Nguen Ngoc Lam, *See* Dinh Sy Hien, 12:16631
Nguen Suan Hong, *See* Dinh Sy Hien, 12:16631
Nguyen, D.H., *See* Waldo, J.B., 12:16079
Nichitiu, F., Mass formula for multibaryon resonances and prediction of a new stable baryon, 12:17146 (R;SU)
Nicholls, R.E., Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)
Nichols, M.C., *See* Johnson, Q.C., 12:16397
Nicholson, J.A., *See* Merlo, C.A., 12:16853
Nicholson, W.L., *See* Cowley, P.J., 12:17656
Nicklas, J.A., *See* Albertini, R.J., 12:16898
Nicol, T.H., Deflection analysis for an SSC [Superconducting Super Collider] dipole magnet with two external supports, 12:16551 (R;US)
Nicolis, G., *See* Puhl, A., 12:16419
Nicolle, J.P., *See* Galmiche, D., 12:17396
Niekusch, E., *See* Coerdt, W., 12:16430
Nielsen, B., Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)
Nielsen, B.S., *See* Atwood, W.B., 12:16658
Nielsen, P., Wind energy activities in Denmark, 12:15651 (BA;US)
Niemi, A.J., *See* Neuberger, H., 12:17184
Nierlich, M., *See* Livet, J., 12:16428
Niesemeyer, N., Selection of working fluids for absorption heat pumps, 12:16204 (R;DE;In German)
Nigg, D.W., *See* Yoon, W.Y., 12:16448
Niimura, M., *See* Dooling, J.C., 12:17422
Niitenberg, A., Search for excellence - goal setting, Ontario Hydro Nuclear Generation experience, 12:15840 (J;US)
Nikolaenko, V.M., Gravitational waves with topological charge, 12:17377 (RA;SU;In Russian)
Nikolajko, A.S., *See* Zdesenko, Yu.G., 12:16644, 12:17226
Nikonov, S.P., *See* Zemlyanukhin, V.V., 12:16032
Niksa, S., Predicting devolatilization at typical coal combustion conditions with the distributed-energy chain model, 12:15334 (BA;US)
Nishihara, H., *See* Behringer, K., 12:15925
Nithianandan, C.K., Calculation of once-through steam generator performance using RELAP5/MOD2, 12:15833 (J;US)
Noggle, T.S., *See* Larson, B.C., 12:16305
Nolan, M.C., *See* Thompson, M.E., 12:16414
Noll, K., Diel vertical movements of bacteria in intertidal streams of Sippewissett Marsh, 12:16833 (RA;US)
Nomura, S., *See* Bottcher, J.H., 12:15977
Noppel, E., *See* Coerdt, W., 12:16430
Norbeck, E., *See* Leeper, R.J., 12:17487
Norby, R.J., Effects of atmospheric CO_2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil, 12:16908 (J;US)
Norman, M.R., Electronic structure of LaN; prediction of a small band overlap semi-metal, 12:16342 (J;GB)
Normand, E., Production of activation products in space-craft components by protons in low earth orbit, 12:17122 (J;US)
Norris, A.E., Fran Ridge horizontal coring summary report hole UE-25h No. 1, Yucca Mountain Area, Nye County, Nevada, 12:16918 (R;US)
Norton, S.A., A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Nosov, S.F., *See* Benko, G., 12:16962
Nourbakhsh, H., *See* Khatib-Rahbar, M., 12:16004
Novakova, O., *See* Jursova, L., 12:16628
Novick, R., *See* Chanan, G.A., 12:17034
Novikov, V.N., *See* Ignat'ev, V.V., 12:15836
Nowatzki, E.A., *See* McCray, J.G., 12:15422
Nozari, F., *See* Price, W.W., 12:16174
Nozik, A.J., Superlattice photoelectrodes for photoelectrochemical cells, 12:15615 (P;US)
Nusshardt, R., *See* Johnson, Q.C., 12:16397
Nyarady, J.F., Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
Nyilas, C.P., *See* Baladi, J.Y., 12:15851

O

O'Brien, D.A., First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
O'Brien, S.C., *See* Heath, J.R., 12:16424
O'Connor, R., *See* Jacobs, M., 12:16212, 12:16214
O'Dell, R., Parallel structuring of control and resources management systems for parallel programs, 12:17670 (BA;US)
O'Hare, T.E., Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
O'Neal, E.M., *See* Cabayan, H.S., 12:17488
O'Neill, E.G., *See* Norby, R.J., 12:16908
O'Neill, J.E., Economic comparison of fusion power plant designs, 12:17592 (J;US)
O'Neill, J.P., *See* Albertini, R.J., 12:16898
Obendorf, D.L., *See* Campbell, J.S., 12:15662
Oblozinsky, P., Particle-hole level densities in the approximation of homogeneous spectrum of single particle levels, 12:17269 (RA;CS)
Particle-hole state densities for statistical multi-step compound reactions, 12:17268 (RA;CS)
See Hlavac, S., 12:17220
See Pivarc, J., 12:16509
Obukhov, Yu.L., *See* Eremin, A.V., 12:16640

Ockers, S.T., *See* Mundy, J.N., 12:16252
Odaka, S., *See* Alexander, J., 12:16659
Oddo, J.M., *See* Maneke, J.L., 12:16108
Oddone, P., Development of high pressure proportional counters, 12:16654 (J;NL)
Odette, G.R., *See* Lucas, G.E., 12:17573
Oeschger, H., Review of the history of atmospheric CO_2 recorded in ice cores, 12:16746 (BA;US)
Ohki, K., Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp, 12:16806 (J;US)
Ohta, M., Influence of gamma-ray skyshine on nuclear facilities design, 12:16117 (J;US)
Ohta, T., *See* Ando, M., 12:16572
Ohtake, M., *See* Masuda, J., 12:15817
Okabe, K., Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)
Okamoto, P.R., *See* Lam, N.Q., 12:16261
See Rehn, L.E., 12:16250
Okano, Kotoyuki, *See* Yoshizawa, Yasukazu, 12:16646
Okun, L.V., On (quasi) stable gluino, 12:17143 (R;SU)
Olejnik, E.E., *See* Dem'yanov, A.V., 12:16512
Olsen, C.S., *See* Akers, D.W., 12:16024
Olsen, K.B., Identification of the physical and chemical characteristics of volcanic hazards, 12:16930 (J;US)
Olson, E.A.J., *See* Koppe, R.H., 12:15770
Olson, J.S., Cenozoic fluctuations in biotic parts of the global carbon cycle, 12:15351 (BA;US)
Major world ecosystem complexes ranked by carbon in live vegetation: a database, 12:16710 (R;US)
Olson, P.M., *See* Sjoeblom, R., 12:16030
Olson, R.E., *See* Watrous, J.J., 12:17557
Omori, E., *See* Fujita, Y., 12:16452
Ong, R., *See* Alexander, J., 12:16659
Orear, J., *See* Amos, N., 12:16657
Orechwa, Y., Physics considerations in the design of long-life cores, 12:15862 (J;US)
See Kamal, S.A., 12:15846
Orient, G.E., A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
Ormiston, B.G., *See* Tice, R.R., 12:16900
Orr, C., *See* Menlove, H.O., 12:16647
Ortega, A., *See* Dunn, J.C., 12:15630
Orth, C.D., Improved understanding of first-wall vaporization-condensation in inertial confinement fusion reactors, 12:17564 (J;US)
Orton, G.S., Infrared observations of planetary atmospheres, 12:16985 (RA;US)
Osborne, R.L., *See* Gonzales, A.J., 12:15696
Osborne, T.W., Feasibility of centralizing disposal and processing facilities for low-level biomedical waste, 12:15541 (RA;US)
Oschman, K.P., Preliminary rock mechanics laboratory: Investigation plan, 12:16924 (R;US)
Osgood, R.M., *See* Daneu, 12:16462
Oshida, Y., *See* Liu, H.W., 12:16287
Osipenko, B.P., *See* Abrosimov, V.N., 12:16632
Osmera, J., Neutron spectrum determination with activation detectors, 12:16623 (RA;CS;In Czech)
Oster, Z.H., *See* Som, P., 12:16824
Ostlie, D.A., Nonlinear RR Lyrae models with time dependent convection, 12:16964 (R;US)
See Cahn, J.H., 12:16965
Ostrovnoj, A.I., *See* Balagurov, A.M., 12:16484
Ostrow, S.L., Intact decommissioning option for nuclear power plants, 12:15543 (RA;US)
Ott, H.R., *See* Willis, J.O., 12:16285
Ouyang Yu, Background for and experience with Qinshan project in China, 12:15874 (RA;XA)
Overbeek, R.A., *See* Lusk, E.L., 12:17643
Ovnanyan, K.M., *See* Akopova, A.B., 12:16607
Ovrut, B.A., Low energy superstring theory, 12:17185 (BA;NL)
Supersymmetric inflation: Recent progress, 12:17390 (BA;US)
Owen, P.T., Overview of decommissioning and decontamination technical information support activities funded by the U.S. Department of Energy's remedial action programs, 12:15501 (RA;US)
Owen, T., Spectroscopic observations of the planets, 12:16986 (RA;US)
Owens, T.L., A folded waveguide coupler for ion cyclotron heating, 12:17541 (J;US)
Oztunali, O.I., *See* Knecht, M.A., 12:15453
See Ostrow, S.L., 12:15543

P

Paal, G., *See* Bagoly, Zs., 12:16961
Paddock, R.A., Radioactive waste isolation in salt: Peer review of the Office of Nuclear Waste Isolation's draft report on a multifactor test design to investigate uniform corrosion of low-carbon steel, 12:16237 (R;US)
Padilla, A. Jr., *See* Waldo, J.B., 12:16079
Padua, D.A., *See* Midkiff, S.P., 12:17664
See Polychronopoulos, C.D., 12:17666
Paffrath, E., *See* Exkstein, P., 12:16557
Pages, P., *See* Tomachevsky, E.G., 12:15489
Pahl, R.G., Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements, 12:15848 (R;US)
Palau, G.L., Training program requirements for remote equipment operators in nuclear facilities, 12:16454 (J;US)
See Auclair, K.D., 12:16455
Palutikof, J.P., Design and use of climatological data banks, with emphasis on the preparation and homogenization of surface monthly records, 12:16772 (J;NL)
Pan, X., *See* Ruckman, M.W., 12:16241
Panagiotakaopoulos, C., Fermion masses in GUTs with intermediate scales, 12:17188 (BA;NL)
Pantoflicek, J., *See* Janta, J., 12:16944, 12:17140
Pape, A., *See* Antony, M.S., 12:17218
Paquette, D.E., *See* Tice, R.R., 12:16900
Paradijs van, J., Compact galactic X-ray sources, 12:16950 (RA;CS)
Paradiso, F.M., *See* Huang, R.L., 12:16077
Pardo, R.C., The ATLAS Positive-Ion Injector project, 12:16541 (R;US)
Paretzke, H.G., *See* Wilson, W.E., 12:17324
Park, A.B., *See* Woodwell, G.M., 12:16780
Park, C., *See* Khatib-Rahbar, M., 12:16004, 12:16102
Park, J.Y., *See* Kassner, T.F., 12:15766
See Shack, W.J., 12:15764
Park, Y.M., *See* Venkateswaran, S.R., 12:15906
Parke, J.M., *See* Sjoeblom, R., 12:16030
Parker, N.R., *See* Benson, R.C., 12:15316, 12:15317
Parkhurst, M.A., *See* Faust, L.G., 12:16875
Parkman, P., *See* Borja, M.A., 12:15633
Parkman, P.A., *See* Borja, M.A., 12:15655
Parks, E.K., *See* Riley, S.J., 12:16401
Parkyn, J.D., 1986 viewpoint of emergency preparedness in the upper midwest, 12:16072 (J;US)
Operational radiation protection for reducing cumulative exposure at a boiling water reactor, 12:16118 (J;US)
Parmer, J.F., *See* Gurol, H., 12:17607
Parry, R.F., Online plutonium x-ray fluorescence analyzer system in F-Canyon, 12:15376 (R;US)
Parsons, D.K., *See* Yoon, W.Y., 12:16448
Partain, L.D., *See* Cape, J.A., 12:15614
Parthasarathi, A.R., Indian experience in investment cost in Small Size Nuclear Power Reactor Units, 12:15886 (RA;XA)
Parzyck, D.C., *See* Copenhaver, E.D., 12:15536
Pascale, F., Quantum-mechanical study of fine-structure transitions in collisions of Rb(5^2Psub(j)) with H_2 and D_2, 12:17064 (R;FR)
Pascale, J., *See* Mestdagh, J.M., 12:17063
Pashchuk, N.N., *See* Kirnas, I.G., 12:16645
Pasoyan, O.I., *See* Arutyunyan, V.N., 12:16546
Pasternak, A., *See* Cohen, J.J., 12:15463
Pate, B.B., *See* Bachrach, R.Z., 12:16570
Patel, A., *See* Gupta, R., 12:17182
Patel, J.G., The U-GAS process for producing gas from coal, 12:15275 (R;US)
Patel, N.T., *See* Mehta, H.S., 12:16029
Pati, S.R., *See* Freeburn, H.R., 12:15971
Patlan', Yu.V., Representation on flow information systems with Petri nets use, 12:17652 (R;SU;In Russian)
See Vishnevskij, V.A., 12:16642
Paul, S., *See* Ellis, R. Jr., 12:17439
Paul, S.F., Measurements of radiated power from the S-1 spheromak, 12:17443 (RA;US)
See Mimura, M., 12:17445
Paulter, N.G., *See* Hammond, R.B., 12:16491
Pavelek, M.D. II, *See* Hinds, S.S., 12:15518
See McDermott, K.J., 12:16131
Pavone, D., *See* Cull, T.A., 12:15582
Payne, M.C., Ab-initio determination of the structure of a grain boundary by simulated quenching, 12:16354 (R;US)

Theoretical investigation of twist boundaries in germanium, 12:16266 (R;US)
Pazdera, F., Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Pearl, W.L., *See* Hook, T.A., 12:15735
Pearman, G.I., *See* Enting, E.G., 12:16755
Peccei, R.D., New directions in high energy physics, 12:17139 (RA;CS)
Pechanski, R., On short-range rapidity fluctuations in high energy collisions, 12:17127 (R;FR)
Pecinka, L., Earthquake resistance problems of primary circuit components, 12:16041 (RA;CS;In Czech)
Problems of vibration of liquid in axially symmetric tanks, 12:16046 (RA;CS;In Czech)
Safety and operating reliability of the WWER reactor. Seismic load, 12:16038 (R;CS;In Czech)
Peck, S.D., *See* Gurol, H., 12:17607
Pedersen, B.M., *See* Beurskens, J., 12:15648
Pedersen, L.D., *See* Merlo, C.A., 12:16853, 12:16854
Pedersen, N.K., Effect of axial diffusional delays on the overall fission gas release, 12:15972 (BA;US)
Pedrow, P.D., *See* Schamiloglu, E., 12:17480
Peelle, R.W., *See* Poenitz, W.P., 12:17192
Peerenboom, J.P., *See* Paddock, R.A., 12:16237
Pellegrini, C., *See* Murphy, J.B., 12:16468
Pelletier, C.A., Initial feasibility study of halogen tracer method for finding boiler tube leaks, 12:15703 (RA;US)
Pellin, M.J., *See* Gruen, D.M., 12:16396
Pelloni, S., *See* Cheng, E.T., 12:17540
Peloquin, R.A., *See* Kennedy, W.E. Jr., 12:15443
Pelroy, R.A., Effects of highly aromatic complex chemical mixtures on the mutagenicity of amino-PAH, nitro-PAH and the intercalating agent, ICR191, 12:15343 (RA;US)
Pelto, P.J., *See* Schneider, K.J., 12:15466
Pendergrass, J.H., Heavy-ion fusion target cost model, 12:17563 (J;US)
Reactor designs for heavy-ion fusion, 12:17618 (J;US)
See Dudziak, D.J., 12:17588
Pendleton, F.J., *See* Muleski, G.E., 12:15753
Pendleton, Y., Infrared reflection nebulae in Orion molecular cloud 2, 12:17035 (R;US)
Penfold, L., *See* Kharkar, D.P., 12:15539
Peng, S.J., Dual loop jet pump model for BWR stability analysis, 12:15795 (J;US)
Peng, T.H., Atmospheric CO/sub 2/ variations based on the tree-ring 13/ sub C/ record, 12:16766 (BA;US)
See Broecker, W.C., 12:16789
Peng, Y.K.M., *See* Flanagan, C.A., 12:17493
See Galambos, J.D., 12:17535
Pennycook, S.J., Transient enhanced diffusion and gettering of dopants in ion implanted silicon, 12:163~4 (J;US)
See Lowndes, D.H., 12:16368
Pepelyshev, Yu.N., Investigation of pattern recognition algorithm to classify the IBR-2 reactor noise spectra, 12:15995 (R;SU;In Russian)
Pepper, J.C., Wind farm economics from a utility perspective, 12:15650 (BA;US)
Peraino, C., *See* Haugen, D.A., 12:15342
Percival, C.M., *See* Bennett, R.H., 12:15450
Perelomov, A.M., *See* Alekseevskij, D.V., 12:17366, 12:17367
Perepelitsa, V.F., *See* Vorob'ev, I.I., 12:17199
Peresypkin, A.I., Study of light pulse shape from polystyrene scintillators, 12:16615 (R;SU;In Russian)
Perez, P., Beam dump neutrino experiments, 12:17108 (RA;CS)
Perez-Mendez, V., Detection of charged particles in amorphous silicon layers, 12:16655 (J;NL)
Perinic, D., Development of large components for the fusion reactor vacuum circuits, 12:17427 (R;FR)
Perjes, Z., *See* Bicak, J., 12:17385
Perkins, L.J., *See* Henning, C.D., 12:17499
Perkins, R.B., *See* Shera. E.B., 12:17224
Perricone, F., *See* Loewen, T., 12:15838
Perry, A.M., Possible changes in future use of fossil fuels to limit environmental effects, 12:16758 (BA;US)
Perry, D.M., *See* Andrews, L.M., 12:16182
Pervushin, V.N., Is it necessary to prove the "potential" confinement in QCD, 12:17174 (R;SU;In Russian)
Pesek, M., Expanding the possibilities of food and feeds irradiation using UVVVR radiation sources, 12:16851 (RA;CS;In Czech)
Success and future potential of ionizing radiations in solving the food problem in the world, 12:16849 (RA;CS;In Czech)
Pesme, D., *See* Galmiche, D., 12:17396
Pesnell, W.D., *See* Cox, A.N., 12:16963
Peterka, F., Transverse vibration of beam with beats, induced by seismic excitation, 12:16043 (RA;CS;In Czech)
Peters, M.W., *See* Starling, K.E., 12:15304
Peters, R.R., Effect of percolation rate on water-travel time in deep, partially saturated zones, 12:15438 (RA;US)
See Klavetter, E.A., 12:15437
Petersen, J.C., Nuclear power plant performance incentives established by state PUCs, 12:15913 (J;US)
Peterson, J.T., *See* Gammon, R.H., 12:16742
Peterson, M.L., Arsenic distributions in porewaters and sediments of Puget Sound, Lake Washington, the Washington coast and Saanich Inlet, B.C., 12:16929 (J;US)
Peterson, R.R., Scaling of vaporization and condensation in heavy ion fusion reactors, 12:17565 (J;US)
See Bartel, T.J., 12:17566
Petitjean, C., *See* Breunlich, W.H., 12:17207
Peto, G., *See* Anriashin, A.V., 12:16627
Petr, J., Reactor physics (nuclear power plant design and operation) and in core dosimetry, 12:16620 (RA;CS;In Czech)
Petravic, M., *See* Sheffield, J., 12:17492
Petrosyan, Eh.E., *See* Kirnas, I.G., 12:16645
Petrov, N.M., Phenomenologic consideration of quark degrees of freedom in potential description approach, 12:17288 (R;SU)
See Babenko, V.A., 12:17371
Petrovic, J.J., Mixed-mode fracture of ceramics, 12:16336 (BA;US)
Petrovsky, V., Physics modelling of reactor V 213-C seismic response, 12:16052 (RA;CS;In Czech)
Petteau, J.L., *See* Lundy, D., 12:15426
Peyser, T., *See* Antoniades, J., 12:17457
Phelps, R.L. Jr., Baseline characterization of electrical circuits to support plant life extension, 12:15821 (J;US)
Philippacopoulos, A.J., SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
Phillips, E.C., Decontamination of the chemical crane room and decontamination and decommissioning of the extraction chemical room at the West Valley Demonstration Project, 12:15544 (RA;US)
Phillips, J.R., *See* Smith, S.T., 12:15565
Pi, S., *See* Guth, A.H., 12:17391
Pianetta, P., *See* Bachrach, R.Z., 12:16570
Picel, K.C., *See* Stamoudis, V.C., 12:15336
Piciulo, P.L., Release of organic chelating agents from solidified decontamination wastes, 12:15408 (R;US)
See Siskind, B., 12:15439
Pickens, J.F., *See* Kelley, V.A., 12:15449
Picklesimer, A., *See* Auerbach, N., 12:17300
Pickrell, J.A., *See* Mauderly, J.L., 12:16893
Picologlou, B.F., Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
See Reed, C.B., 12:17518
Picraux, S.T., *See* Chu, W.K., 12:16366
See Sorensen, N.R., 12:16297
Pierce, N.T., *See* Beck, W.K., 12:17608
Pierce, R.D., High-temperature fuel cells, 12:16192 (R;US)
Investigation of alternative MCFC cathode materials at Argonne National Laboratory, 12:16196 (BA;US)
Pierlas, C., *See* Gauchon, J.P., 12:15772
Piesch, E., *See* Boehm, J., 12:16649
Piet, S., *See* Sze, D.K., 12:17514
Piet, S.J., Inherent/passive safety for fusion, 12:17546 (J;US)
Pietrzyk, Z.A., Preliminary experimental results with the coaxial slow source, 12:17466 (RA;US)
See Hahn, K.D., 12:17467
Pigford, T.H., *See* Chambre, P.L., 12:15474, 12:15476
See Lee, W.W.L., 12:15475
Pike, R., *See* Gaskell, G., 12:16166
Pikel'ner, L.B., *See* Meister, A., 12:17251
Pillsbury, R.D., *See* Beck, W.K., 12:17608
Pillsbury, R.D. Jr., PF coil system comparisons for a compact ignition device, 12:17536 (J;US)
Pilz, W., *See* Ignatovich, V.K., 12:17230
See Meister, A., 12:17251
Pin, F.G., *See* Goldstein, M., 12:16440

See Horwedel, J.E., 12:17654
Pitcher, E.J., January and July simulations with a spectral general circulation model, 12:16699 (J;US)
Pitts, J.H., Turbostar: An ICF reactor using both direct and thermal power conversion, 12:17562 (J;US)
Piulle, W.V., *See* Heaphy, R.F., 12:15747
Piuz, F., *See* Beuttenmuller, R., 12:16660
Pivarc, J., Recent developments in the multipurpose intense 14 MeV neutron source at Bratislava, 12:16509 (RA;CS)
See Hlavac, S., 12:17220
Plaks, N., *See* Yamamoto, T., 12:15740
Platts, D.A., Introduction to the m = 1 helicity source, 12:17454 (RA;US)
See Fernandez, J.C., 12:17452
See Wright, B.L., 12:17455
Plecher, K., Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Plueddemann, E.P., *See* Koenig, J.L., 12:15604
Plunk, O., *See* Hooks, W., 12:15749
Plyashkevich, S.N., *See* Arkhipov, V.V., 12:17149
Plyushchaj, M.S., Baryon string model. Part 3. Quantum theory of single-mode configurations of three-string, 12:17361 (R;SU;In Russian)
Pochelon, A., *See* Hollenstein, Ch., 12:17412
Pocock, F.J., Babcock & Wilcox Company water chemistry guidelines for once-through steam generators and drum boilers, 12:15710 (RA;US)
Podowski, M.Z., *See* Peng, S.J., 12:15795
Podrouzek, J., Protection of WWER type primary loops against extreme effects, 12:16054 (RA;CS;In Czech)
Poenitz, W.P., Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models, 12:17192 (R;US)
Pogatshnik, G.J., UV laser induced photochromic centers in cerium doped calcium fluoride, 12:16351 (R;US)
Pogosov, V.S., *See* Arutyunyan, V.N., 12:16546
Poisson, A., *See* Chen, C.T.A., 12:16788
Pojar, M.G., Surface and underground coal-mine-equipment population, 1982. Information Circular/1986, 12:15322 (R;US)
Poker, D.B., Dose dependence of ion beam mixing of Au on amorphous and single crystalline Si and Ge, 12:16316 (J;US)
Pokrovskij, V.N., *See* Inoyatov, A.Kh., 12:16636
Polehn, J.L., Health physics program for the Edgemont Uranium Mill decommissioning project, 12:15498 (RA;US)
See Wallace, R.G., 12:15549
Polidan, R.S., *See* Holberg, J.B., 12:17020
Polidoroff, C., Plant experience with temporary reverse osmosis makeup water systems, 12:15824 (J;US)
Pollacco, E.C., Evolution of the fusion like process around the Fermi energy, 12:17227 (R;FR)
Polubarinov, I.V., Higher hypercomplex numbers and quantum mechanics, 12:17373 (R;SU)
Polychronakos, V.A., *See* Beuttenmuller, R., 12:16660
Polychronopoulos, C.D., Execution of parallel loops on parallel processor systems, 12:17666 (BA;US)
Speedup bounds and processor allocation for parallel programs on multiprocessors, 12:17662 (BA;US)
Polzer, W.L., *See* Fuentes, H.R., 12:15440
Pon, W.D., Conversion of radionuclide transport codes to IBM-compatible microcomputers, 12:17328 (J;US)
Ponder, T.C. Jr., *See* Zimmer, R.A., 12:16704
Pong, L.C., Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)
Popa, F.D., *See* Simmons, R.L., 12:15956
Popov, A.K., Stability of a periodically pulsed reactor, 12:15960 (R;SU;In Russian)
Transfer function of a periodically pulsed reactor, 12:15959 (R;SU;In Russian)
Popytaev, A.N., *See* Burtsev, V.A., 12:17414
Porrati, M., *See* Ferrara, S., 12:17388
Porter, D.L., Factors controlling metal fuel lifetime, 12:15850 (R;US)
See Seidel, B.R., 12:15979
Portis, A.R. Jr., *See* Spalding, M.H., 12:16810
Pospisil, M., *See* Bondy, R., 12:16847
See Hanis, T., 12:16846
Post, D., *See* Sheffield, J., 12:17492
Potok, R.E., *See* Cohn, D.R., 12:17543
Potter, R.F., *See* Miller, C.E., 12:15502
Poulain, M., *See* Tallant, D.R., 12:16334, 12:16334
Pounds, J.G., *See* Hanson, A.L., 12:16534
Pouquet, A., Magnetohydrodynamic turbulence, 12:17089 (RA;CS)
Powers, B.A., *See* Holladay, D.W., 12:15534
Powers, H.R. Jr., Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)
Pracs, C., Test unit for measurement of small masses of alpha wastes, 12:15409 (R;FR;In French)
Prange, M., Investigation of extraction of a model mixture similar to coal oil with supercritical gases, 12:15289 (R;DE;In German)
Prasil, Z., *See* Pesek, M., 12:16849, 12:16851
Prassinos, P., *See* Burgher, L.M., 12:17658
Pratt, W.T., *See* Khatib-Rahbar, M., 12:16102
Prazhak, F., *See* Abrosimov, V.N., 12:16632
Prechter, R., *See* Scalise, D.T., 12:15760
Prelas, M.A., *See* Kunze, J.F., 12:17537
Premuzic, E.T., *See* Walsh, J.J., 12:16786
Prescott, C.Y., *See* Atwood, W.B., 12:16658
Presler, A.F., *See* Lu, C., 12:16194
Presperin, V., *See* Bem, P., 12:17278
Prewett, S.V., *See* Cole, L.W., 12:15500
Pribylova, M., *See* Bondy, R., 12:16847
Price, J., *See* Drake, J., 12:15622
Price, J.D., *See* Wan, E.I., 12:15592, 12:15593, 12:15594
Price, L.E., Report of the working group on detector simulation, 12:16594 (R;US)
Price, R.E., Deuterium driven D - T fusion reactor test facility, 12:17587 (J;US)
Price, R.J., *See* Hopkins, G.R., 12:17572
Price, R.T., Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Price, W.W., Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report, 12:16174 (R;US)
Prikhod'ko, V.I., *See* Butenko, V.A., 12:16630
Pritchett, J.E., *See* Simmons, R.L., 12:15956
Probst, P., PKL, 12:16008 (R;FR;In French)
Prokoshkin, Yu.D., Experiment to study the gluon interactions and glueball production in the central region of hadron collisions at UNK energies (2-3 TEV), 12:17103 (R;SU)
Pron'ko, G.P., *See* Plyushchaj, M.S., 12:17361
Prosser, F.W., Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Proust, E., *See* Carre, F., 12:17426
Provencher, R., Comparison of the response of a NaI scintillation crystal with a pressurized ionization chamber as a function of altitude, radiation level, and Ra-226 concentration, 12:15530 (RA;US)
Pruitt, J.S., Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards, 12:17331 (R;US)
Prunele, E. de, Influence of an external electric field on thermal collisions between circular Rydberg-state atoms and ground-state helium, 12:17061 (R;FR)
Pruss, S., *See* Amos, N., 12:16657
Prussin, S., *See* Markoff, D., 12:16121
Pugsley, J., *See* Hook, T.A., 12:15735
Puhl, A., Micromixing and multiple steady state transitions in a CSTR, 12:16419 (J;GB)
Puigh, R., *See* Abdou, M., 12:17529
See Gierszewski, P.J., 12:17531
Pujo, P. de, *See* Mestdagh, J.M., 12:17063
Purdy, C.M., *See* Harms, W.O., 12:15866
Puri, K., *See* Pitcher, E.J., 12:16699

Q

Qian, S., *See* Zhang, Y., 12:16585
Qin, X., ESR studies on the radical cation mechanism of the ring opening of cyclopropylamines, 12:16411 (J;US)
Qiu, L.J., HESYRL: a dedicated synchrotron radiation laboratory in China, 12:16583 (RA;US)
Quanci, J., Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)

Quebert, J., Two-particle correlations in $^{40}Ar + {}^{197}Au$ at 60 MeV/A, 12:17234 (R;FR)
Quihillalt, O.J., Experience with Atucha I Nuclear Power Plant, both as regards technology transfer arrangements and operational experience, 12:15873 (RA;XA)
Quilici, M., *See* Bertucio, R., 12:16081
Quinlan, F., *See* Karl, T.R., 12:16695
Quinn, E.L. Jr., *See* Phelps, R.L. Jr., 12:15821
Quinn, G.J., *See* Box, W.D., 12:15800

R

Raab, H.F., *See* Tessler, G., 12:15864
Raby, S., Supersymmetry and model building, 12:17179 (R;US)
See Jones, D.R.T., 12:17395
Racek, J., Assessment of in core dosimetry measuring systems, 12:16621 (RA;CS;In Czech)
Rackliffe, G.B., Simulation of geomagnetic currents induced in a power system by magnetohydrodynamic electromagnetic pulses, 12:15666 (R;US)
Radeka, V., *See* Beuttenmuller, R., 12:16660
See Fischer, J., 12:16652
Radtke, W.H., *See* Mott, J.E., 12:15976
Radyushkin, A.V., *See* Korchemskij, G.P., 12:17170
Raffray, A.R., Cost study of the ESPRESSO blanket for a tandem mirror reactor, 12:17599 (J;US)
Liquid momentum removal using rod arrays applied to the HYLIFE ICF reactor, 12:17568 (J;US)
Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor, 12:17605 (J;US)
Ragheb, M., *See* Abdelhai, M., 12:16111
Ragland, C., *See* West, L., 12:16161
Rahe, J., *See* Larson, S., 12:17027
Rainisch, R., Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel, 12:16116 (J;US)
Rajner, V., *See* Rank, D., 12:16791
Rakel, D.A., Calibration of neutron correlation counters by calorimetry and gamma-ray measurements, 12:16664 (J;US)
Raley, J.H., *See* Singleton, M.F., 12:15373
Ramalho, A., *See* Menlove, H.O., 12:16647
Ramanathan, V., *See* Pitcher, E.J., 12:16699
Ramaty, R., *See* Dermer, C.D., 12:17042
Ramendik, Z.A., *See* Burtsev, V.A., 12:17414
Randall, R.L., *See* Graham, L.J., 12:15698
Randall, W.S., *See* Uhland, D.W., 12:15488
Ranganath, S., *See* Mehta, H.S., 12:16029
Rank, D., Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)
Rankin, R.L., *See* Kaufman, I., 12:15707
Rao, C.D., Financial assurance for decontamination and decommissioning: a Texas perspective, 12:15511 (RA;US)
Rao, U.R.K., *See* Momin, A.C., 12:16399
Rapkin, M., *See* Metting, N.F., 12:17320
Rapoport, W.R., *See* Sam, R.C., 12:16470
Raps, S., Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa, 12:16807 (J;US)
Raptis, A.C., *See* Bobis, J.P., 12:15273
See Doss, E.D., 12:15323
See Sheen, S.H., 12:16599
Rasmussen, B., The EEC Wind Energy R&D Programme, 1985-1988, 12:15658 (BA;US)
Rasmussen, D.A., *See* Hillis, D.L., 12:17415
Rasmussen, O.R., Health physics experience in the decontamination and decommissioning of the 203-S, 204-S, and 205-S uranium nitrate hexahydrate purification and waste tank car unloading facilities, 12:15533 (RA;US)
Rasneur, B., *See* Lefevre, F., 12:17429
See Roth, E., 12:17428
Rastberger, S.B., *See* Doyle, R.D., 12:15468
Rataj, J., Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 1, 12:15926 (RA;CS;In Czech)
Rath, W.R., *See* Spitulnik, J.J., 12:15922
Rathbun, L.A., *See* Swinth, K.L., 12:16876
Rathkopf, J.A., Method of baffle/reflector region homogenization, 12:15816 (J;US)
Rawlins, J.A., *See* Campbell, L.R., 12:15861
Ray, H.B., Search of excellence: the problems of material aging and reliability in an older nuclear unit at the Southern California Edison company, 12:15828 (J;US)
Ray, J.E., OECD Consensus and loan conditions on officially supported financing for nuclear power plants, 12:15900 (RA;XA)
Razorenov, L.A., *See* Kurnosova, L.V., 12:17284
Razumov, A.V., *See* Plyushchaj, M.S., 12:17361
Reasoner, J.W., *See* Riley, J.T., 12:15325
Rebizant, J., *See* Lander, G.H., 12:16313
Reece, W.D., *See* Faust, L.G., 12:16875
Reed, C.B., Techniques for measurement of velocity in liquid-metal MHD flows, 12:17518 (J;US)
See Picologlou, B.F., 12:17522
Reed, D.T., *See* Lewis, M.A., 12:16263
Reed, R.P., *See* Polehn, J.L., 12:15498
See Wallace, R.G., 12:15549
Rees, M.J., Neutrino masses and galaxy formation, 12:10953 (RA;CS)
Reeves, L.R., *See* Salomon, J.H., 12:15691
Rega, A., *See* Giaquinto, L., 12:15659
Regis, J.P., *See* Devolpi, A., 12:16014
Regis, V., *See* Famiglietti, M., 12:15700
Regner, R., Combination technique: Gas heat pump/cogeneration unit - tandem heating power heat pumps, energy concept of Siemens AG, 12:15678 (RA;DE;In German)
Regulla, D., *See* Boehm, J., 12:16649
Reguly, T.M., *See* Curran, R.P., 12:15685
Rehme, K., Velocity and turbulence distributions in wall subchannels of a rod bundle with a spacer grid, 12:16475 (R;DE;In German)
Rehn, L.E., Detection of near-surface ^{52}Cr segregation in irradiated $^{51}V(Cr)$ by RBS [Rutherford Backscattering Spectrometry], 12:16257 (R;US)
Production of freely-migrating defects during irradiation, 12:16250 (R;US)
See Frank, R.C., 12:16302
Reichle, D.E., *See* Trabalka, J.R., 12:16737, 12:16741
Reiff, W.M., *See* Torardi, C.C., 12:16335
Reilly, C.A., *See* Gray, R.H., 12:15340
Reilly, J., Global energy and carbon dioxide, 12:16701 (R;US)
Reilly, J.M., *See* Edmonds, J.A., 12:16700
Reisdorf, W., Sub-barrier fusion, 12:17261 (R;DE)
Reister, D.B., Sensitivity analysis of ORION, 12:15362 (R;US)
Rej, D.J., Recent FRC translation experiments on FRX-C/T, 12:17469 (RA;US)
See Armstrong, W.T., 12:17470
See McKenna, K.F., 12:17474
See Tuszewski, M., 12:17473
Rejent, B., *See* Podrouzek, J., 12:16054
Rejf, P., Dynamic response of nuclear power plant generating unit at simulated seismic excitation, 12:16045 (RA;CS;In Czech)
Rejholec, J., *See* Vacek, K., 12:16852
Remelius, D.K., *See* Barnes, N.P., 12:16469
Remsberg, E.E., Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)
Renne, R.A., *See* Gray, R.H., 12:15340
Rense, C.E.C., Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
Rerichova, M., *See* Pesek, M., 12:16851
Resele, G., Hydrogeological basis for the modelling area Oberbauenstock, 12:15434 (R;CH;In German)
Rettich, S., Short-distance heat supply in Rottweil with cogeneration systems and heat pumps, 12:15675 (RA;DE;In German)
Reuter, R.C. Jr., Residual effects in laminated, curved, composite panels, 12:16236 (R;US)
Reval, J., *See* Foeldy, L., 12:17383
Revol, G., *See* Faugeras, P., 12:15380
Reynolds, A.B., *See* Mattox, G.C., 12:16164
Reynolds, J.F., Predicting the response of plants to increasing carbon dioxide: a critique of plant growth models, 12:16764 (J;NL)
Rezowalli, J.J., *See* King, M.S., 12:16926
Rhee, B.W., Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach, 12:16003 (J;US)
Rhoades, C.E. Jr., *See* Barlow, T.A., 12:17326
Rhodes, C.K., Physical processes at high field strengths, 12:17066 (R;US)
Rhodes, E.A., *See* Devolpi, A., 12:16014
Rhodes, R.C., Precision and accuracy assessments for state and local air-monitoring networks, 1984, 12:16720 (R;US)
Rice, J.K., Nuclear reactor excitation of XeF laser gas mixtures, 12:16467 (R;US)
Rich, J.M., *See* Lahti, G.P., 12:16115
Richard, A., Surface quenching of zirconium alloys by laser, 12:16246 (R;FR;In French)

Richard, J.J., *See* McGowan, C.W., 12:15374
Richard, P., *See* Schlachter, A.S., 12:17081
Richards, R.K., *See* Hillis, D.L., 12:17415
Richardson, B.S., *See* Hamel, W.R., 12:16441
Richardson, I.G., *See* Sanderson, T.R., 12:16966
Richel, H., *See* Draulans, J., 12:16442
Richmond, C.R., Task group on Reference Man to revise ICRP Publication 23, 12:17334 (J;US)
Richner, M., *See* Analytis, G.T., 12:16135
Richter, D., *See* Maerten, H., 12:17245
Richter, D.D., *See* Johnson, D.W., 12:16781
Richter, G.N., Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Rider, R.L., *See* Brown, D.A., 12:16127
Riedinger, L.L., High-spin states and coexisting states in the Pt-Au transition region, 12:17235 (R;US)
Rieke, G.H., *See* Lebofsky, L.A., 12:17008
Riggin, R.M., *See* Howes, J.E., 12:16715
Riggs, B.K., *See* Griggs, D.P., 12:16123, 12:16125
Riley, B.A., How to set up a successful production graphics facility, 12:17642 (R;US)
Riley, J.T., Establishment of data bank on the self-heating of coal. Final report, 12:15325 (R;US)
Riley, S.J., Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
Ringot, C., *See* Tomachevsky, E.G., 12:15489
Rinker, G.A., Nuclear interlevel transfer driven by collective outer shell electron oscillations, 12:17351 (R;US)
Rinker, G.A. Jr., *See* Shera. E.B., 12:17224
Riordan, C., The SERI Resource Assessment Project's plan for collecting spectral-solar-irradiance data, 12:15597 (R;US)
Ritchie, R.H., *See* Miller, J.H., 12:17322
Ritter, E.T., *See* Shera. E.B., 12:17224
Ritter, J.E., Erosion damage in glass and alumina, 12:16330 (R;US)
Ritzman, R., *See* Johnson, I., 12:15965
Ritzman, R.L., *See* Simms, R., 12:16106
Rivard, J.B., The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Rivers, M.L., *See* Hanson, A.L., 12:16534
See Spanne, P., 12:16595
See Sutton, S.R., 12:16535
Riyopoulos, S., *See* Tajima, T., 12:17401
Roberson, P.L., Department of Energy Laboratory Accreditation program for occupational exposure measurements, 12:16877 (RA;US)
See Faust, L.G., 12:16875
See McDonald, J.C., 12:16874
See Swinth, K.L., 12:16876
Roberts, B., Solitons in astrophysics, 12:17405 (RA;CS)
Roberts, P.N., *See* Chen, Y., 12:15744
Roberts, R., *See* Kunze, J.F., 12:17537
Robertson, C.Y., Chemtaxis in Spirochaeta aurantia: a possible cation effect. Screening for potential chemorepellents, 12:16834 (RA;US)
Robey, S.W., *See* Barton, J.J., 12:16323
Robinet, M.J., Using a HPGe detector and micro R meter for quick and simple estimate of radionuclide activity in LSA shipping containers, 12:15531 (RA;US)
Robinson, A.H., *See* Burnside, R.J., 12:15842
Robinson, G.E., *See* Brownson, D.A., 12:16064
Robinson, R.L. Jr., Phase behavior of coal fluids: Data for correlation development: Report for the period August 1, 1986 to October 31, 1986, 12:15301 (R;US)
Robotham, A.J., *See* Boyle, G.A., 12:15665
Rochester, L.S., *See* Atwood, W.B., 12:16658
Roddy, J.W., *See* Mailen, J.C., 12:15416
Rodenhaeuser, F., Fossil fuels - reserves, consumption and environment, 12:16169 (RA;DE;In German)
See Schulz, W., 12:16202
Rodgers, D., *See* Kharkar, D.P., 12:15539
Rodgers, P.W., *See* Harben, P.E., 12:15349
Rodman, M.R., *See* Chen, C.T.A., 12:16792
Rodrigues, A.R.D., Brazilian Synchrotron Radiation Project, 12:16588 (RA;US)
Roesch, W.C., Averaging dose in inhomogeneously irradiated tissue, 12:17332 (RA;US)
Beta-particle dosimetry, 12:16863 (RA;US)
See Metting, N.F., 12:16866
See Nelson, J.M., 12:16867
Roesler, F.L., *See* Scherb, F., 12:17012
Roessler, P., *See* Barclay, W., 12:15613
Roettenbacher, L., Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae, 12:15590 (R;DE;In German)
Roganov, A.B., *See* Elizarov, O.I., 12:16639
Rogers, F.J.G., *See* Menlove, H.O., 12:16647
Rogers, M.L., Water detritiation for present and future fusion plants, 12:17613 (J;US)
Rogers, V.C., Disposal of BRC wastes containing short-lived radionuclides, 12:15457 (J;US)
Rogner, H.H., Long-term energy projections and novel energy systems, 12:16198 (BA;US)
Rohatgi, N.K., Silicon production in a fluidized bed reactor: Final report, 12:15606 (R;US)
Rohr, G., Method to determine the pairing energy for excited nuclei, 12:17267 (RA;CS)
Rojas, R., Excitations in small spherical particles, 12:17358 (R;US;In Spanish)
Rollett, A.D., The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
Roman, H.T., *See* McDermott, K.J., 12:16131
Romrell, D.M., *See* Anglesey, M.O., 12:15997
Ronca-Battista, M., Inventory of sites used to develop residual radioactivity criteria, 12:15553 (RA;US)
See Lichtman, S., 12:15490
Roncadelli, M., Astrophysics and grand- and superunification, 12:16954 (RA;CS)
Rondio, J., Analog giant dipole excitation in /sup 58/Ni(n,p)/sup 58/Co reaction at 17.3 MeV neutron energy, 12:17221 (RA;CS)
Rood, A.S., *See* Kark, J.B., 12:15532
Roofthooft, R., *See* Lundy, D., 12:15426
Rosard, D.D., *See* Davidson, M.J., 12:15702
Rose, J.H., *See* Kogan, V.G., 12:16485
Rose, W.W., *See* Merlo, C.A., 12:16853, 12:16854
Rosen, B.R., *See* Ackerman, J.L., 12:16327
Rosenberg, L.J., *See* Howell, R.H., 12:16312
Rosenfeld, L., *See* Ritter, J.E., 12:16330
Rosenwinkel, E., *See* Miller, T., 12:16315
Ross, J.M., *See* Greiner, G.P., 12:16717
Ross, P.N., *See* Beard, B.C., 12:16300
Rossi, F., *See* Pascale, F., 12:17064
Rossi, H.H., *See* Metting, N.F., 12:17320
Rossi-Alvarez, C., *See* Della Mea, G., 12:16349
Rossler, F.L., *See* Scherb, F., 12:16987
Rost-Siebert, K., Investigations in the toxic effect of H ions and Al ions on seedlings of spruce (Picea abies, KARST.) and beech (Fagus sylvatica, L.) in a solution culture, 12:16903 (R;DE;In German)
Rostoker, N., *See* Katzenstein, J., 12:17481
Roth, E., Study of a breeding material - γ lithium aluminate, 12:17428 (R;FR)
Rothberg, G.M., Spin polarized photoelectron studies of magnetism in solids: Progress report for period June 1, 1986-May 31, 1987, 12:16265 (R;US)
Rothenburg, S.J., *See* Wolff, R.K., 12:16894
Rothwell, I.P., *See* Chamberlain, L.R., 12:16409
Rottmann, J., Analysis of materials (metals, ceramics, minerals) using spectroscopic methods, 12:16390 (R;DE)
Rotty, R.M., Fossil fuel combustion: recent amounts, patterns, and trends in CO_2, 12:16757 (BA;US)
Roucks, M., Control calculations of seismic effects on pipes using integrated program package, 12:16055 (RA;CS;In Czech)
Routbort, J., *See* Blank, H., 12:15378
Rowe, G.T., *See* Walsh, J.J., 12:16786
Rowe, R.W., *See* Bizais, Y.J., 12:16821
Rowe, W.S., *See* Chao, F.C., 12:15788
Rowland, T.C., Performance of boiling water reactor fuel lead test assemblies to 35 MWd/kg U, 12:15780 (J;US)
Roybal, G.S., *See* Harker, Y.D., 12:16923
Ruby, A., *See* Godfrey, P.J., 12:16783
Ruby, L., *See* DiPeso, G.J., 12:15998
Ruckman, M.W., Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Rudd, M.E., *See* DuBois, R.D., 12:17318
Ruddiman, W.F., *See* Mix, A.C., 12:16922
Ruddy, F.H., Analyses of solid-state track recorder pressure vessel neutron dosimetry, 12:15951 (J;US)
Rue, D.M., Recent developments in wet carbonization of peat, 12:15274 (R;US)
Ruemmler, P.S., *See* Sullivan, M.F., 12:16880
Ruf, H., *See* Coerdt, W., 12:16430

Rugenstein, W.A., *See* Muleski, G.E., 12:15753
Ruggiero, A.G., The ANL experiment for a wake field accelerator using an rf structure, 12:16502 (R;US)
Ruggiero, F., Theoretical aspects of some collective instabilities in high-energy particle storage rings, 12:16590 (R;XC)
Rujula, A. De, Aborigines of the nuclear desert, 12:16952 (RA;CS)
Rujula De, A., Neutrino physics at future colliders, 12:17109 (RA;CS)
Rukhadze, A.A., *See* Karbushev, N.I., 12:16525
Ruska, M.D., Virginia Power and Department of Energy spent fuel transportation experience, 12:15397 (R;US)
Russ, J.S., *See* Beuttenmuller, R., 12:16660
Russell, J.M. III, *See* Remsberg, E.E., 12:16707
Ruther, W.E., *See* Kassner, T.F., 12:15766
See Shack, W.J., 12:15764
Rutkevich, B.N., Non-linear stage of beam instability in the absence of electron capture by a wave field, 12:17410 (R;SU;In Russian)
Rutkevich, P.B., *See* Rutkevich, B.N., 12:17410
Rutlo, J.J., *See* Skowronski, R.P., 12:15308
Ruzmajkin, A.A., Astrophysical dynamo, 12:17088 (RA;CS)
Ryan, J.L., *See* Ballou, J.E., 12:16881
Ryan, T.G., Human factors in risk assessments of nuclear power plants, 12:16070 (J;US)
Rybakov, Yu.V., *See* Zemlyanukhin, V.V., 12:16032
Ryckbosch, D., Isospin mixing during the decay of the Giant Dipole Resonance, 12:17274 (RA;CS)
Ryder, C., *See* Khatib-Rahbar, M., 12:16102
Rydin, R.A., *See* Wilson, G.L., 12:16479
Ryter, F., *See* Hollenstein, Ch., 12:17412

S

Saadatmand, K., Neutral beam probe for potential measurements in Phaedrus minimum-B end plug, 12:17421 (BA;US)
Saal, G., *See* Zeitzchel, G., 12:15396
Sabochick, M.J., Calculation of the properties of vacancy clusters in copper using a new, efficient energy minimization scheme, 12:16251 (R;US)
Sabourin, P.J., *See* Bond, J.A., 12:16890
Sahraoui, C., *See* Tsang, F.Y., 12:17526
Saint-Laurent, F., *See* Kyanowski, A., 12:17236
Sakhno, V.I., Problems and perspectives of the U-240 control system development, 12:16510 (R;SU;In Russian)
Sal'nikov, O.A., *See* Kuz'minov, B.D., 12:17244
See Lovchikova, G.N., 12:17277
Salatov, A.V., *See* Solyany, V.I., 12:16021
Salem, S.I., *See* Listvinsky, G., 12:17507
Salim, T., Countercurrent flow and flooding with abrupt area changes, 12:15793 (J;US)
Salmon, J., CUBIX: Programming hypercubes without programming hosts, 12:17646 (R;US)
Salomon, J.H., On-line vibration monitoring at the United Illuminating Company, 12:15691 (RA;US)
Salvetat, G., *See* Gilbert, M., 12:16400
Sam, R.C., Sustained performance of a 100 W, 240 Hz alexandrite laser, 12:16470 (BA;US)
Sameh, A., *See* Berry, M., 12:17668
Sami, S.M., Modeling of drift effects in CANDU reactors, 12:15844 (J;US)
Sams, T.L., *See* McDaniel, E.W., 12:15414
Samuel, E.A., Catenary analysis of a fabric filter bag during reverse-gas cleaning, 12:15745 (RA;US)
Samuels, J.N., Prediction of transient axial power distribution for calculation of the DNBR limit, 12:15794 (J;US)
Sanchez-Rubio, *See* Daneu, 12:16462
Sanda, A.I., *See* Bigi, I.I., 12:17157
Sanderson, T.R., Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Sandford, S., Interplanetary and interstellar dust, 12:17023 (RA;US)
Santarsiero, B.D., *See* Thompson, M.E., 12:16414
Sapienza, R.S., *See* O'Hare, T.E., 12:15587, 12:15588, 12:15589
Sarikov, N.A., *See* Kalinovskij, Yu.L., 12:17145
Sarkisov, V.Kh., *See* Atabekyan, R.R., 12:17344
Sarkisyan, G.Kh., *See* Akopyan, V.P., 12:16527
Sarkisyan, L.A., *See* Dem'yanov, A.V., 12:16512
Sarkisyan, Yu.G., *See* Gavalyan, V.G., 12:16608
Sarmiento, J., Three-dimensional ocean models for predicting the distribution of CO_2 between the ocean and atmosphere, 12:16752 (BA;US)
Sasser, L.B., *See* Springer, D.L., 12:15338
Sauers, I., Process for measuring degradation of sulfur hexafluoride in high voltage systems, 12:16422 (P;US)
Savoie, F.E., *See* Fenske, G.R., 12:15849
Savolainen, K., LWR Fuel failure detection using the grip sipping method, 12:15779 (J;US)
Sawan, M., *See* Youssef, M., 12:17589
Sawan, M.E., Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
Superconducting magnet radiation effects in fusion reactors, 12:17575 (J;US)
See Svintoslavsky, I.N., 12:17511
Sawley, M.L., *See* Hollenstein, Ch., 12:17412
Sawochka, S.G., Improved water chemistry controls for minimizing degradation of materials, 12:15811 (J;US)
See Hook, T.A., 12:15735
Sawyer, C.D., *See* Huang, R.L., 12:16077
Saylor, W.W., *See* Dudziak, D.J., 12:17588
Sazdjian, H., Connection of two-particle relativistic quantum mechanics with the Bethe-Salpeter equation, 12:17142 (R;FR)
Scalise, D.T., Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines, 12:15760 (R;US)
Scandolo, D., *See* Famiglietti, M., 12:15700
Schaefer, W.P., *See* Hopkins, M.D., 12:16410
See Thompson, M.E., 12:16414
Schafer, S., *See* Maan, M.A., 12:16009
Schaffer, M.J., *See* Schultz, K.R., 12:17505
Schamiloglu, E., Ion ring experiments with applications to the compact toroid program, 12:17480 (RA;US)
Schauss, R.D., Use of computerized, 3-dimensional solids modeling and data base management to support radiation mapping and ALARA planning, 12:15555 (RA;US)
Scheele, D., *See* Kroon, P., 12:16208
Scheetz, J., *See* Imam, I., 12:15695
Scheibel, J., *See* Chari, M.V.K., 12:15706
See Frarey, J.L., 12:15690
See Hook, T.A., 12:15735
See Tuten, J.M., 12:15688
Scheibel, J.R., Current developments in diagnostic monitoring, 12:15681 (RA;US)
See Davidson, M.J., 12:15702
See Graham, L.J., 12:15698
See Mannava, S.R., 12:15705
See Sioshansi, P., 12:15704
Schenk, V., Dynamic parameters of seismic waves and the seismic threat to a nuclear power plant site, 12:16039 (RA;CS;In Czech)
Schenkel, R., *See* Menlove, H.O., 12:16647
Schenkel, W., Energy from waste: Is it ecologically acceptable, 12:16488 (RA;DE;In German)
Schenkova, Z., *See* Schenk, V., 12:16039
Schenter, R.E., *See* Bechtold, R.A., 12:15984
Scherb, F., Ground-based observations of the Jupiter plasma torus, 12:16987 (RA;US)
Ground-based observation of Comet Halley, 12:17012 (RA;US)
Scherpelz, R.I., *See* Faust, L.G., 12:16875
Schick, L., *See* Oddone, P., 12:16654
Schick, W.C. Jr., *See* Tessler, G., 12:15864
Schidlovsky, G., *See* Jones, K.W., 12:16885
Schillebeeckx, P., Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
Schimmerling, W., *See* Metting, N.F., 12:17320
Schindler, K., Magnetic reconnection in astrophysics, 12:16945 (RA;CS)
Schinke, R., Rotational energy transfer in molecule-molecule and molecule-surface collisions, 12:17076 (RA;CS)
Schlachter, A.S., Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
Schlanger, E.H., Computer-aided design of glove boxes and enclosures, 12:16447 (J;US)
Schleicher, D.C., *See* Baum, W.A., 12:16995
Schlenker, R.A., Age dependent retention of ^{212}Pb in the skeleton following ^{224}Ra uptake, 12:16857 (R;US)
Radium uptake in utero, 12:16856 (R;US)
See Keane, A.T., 12:16855
Schlesinger, M.E., *See* Wigley, T.M.L., 12:16761

Schlesinger, W.H., Changes in soil carbon storage and associated properties with disturbance and recovery, 12:16778 (BA;US)
Schloerb, F.P., *See* Irvine, W.M., 12:17025
Schlom, J., *See* Brechbiel, M.W., 12:16841
Schmidt, D., Neutron scattering on light even-even nuclei, 12:17214 (RA;CS)
See Exkstein, P., 12:16557
Schmidt, E., *See* Khatib-Rahbar, M., 12:16004
Schmidt, P., *See* Fellinger, J., 12:16634
Schmidt-Boecking, H., *See* Schlachter, A.S., 12:17081
Schmitt, D., *See* Casser, E., 12:16153
Schmitter, R.D., Sediment transport characteristics of the nearshore zone between Hilton Head and Ossabaw Islands, Georgia as determined by heavy mineral analysis, 12:16934 (R;US)
Schmitz, W., *See* Riedinger, L.L., 12:17235
Schneider, K.J., Radiation doses in alternative commercial high-level waste management systems, 12:15466 (J;US)
Schneider, M., *See* Praca, C., 12:15409
Schneidmiller, D., *See* Sjoeblom, R., 12:16030
Schnurr, N.M., *See* Miller, R.L., 12:17502
Schoenfeldt, W.A., Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22, 12:17071 (R;DE)
Schoessow, P., *See* Ruggiero, A.G., 12:16502
Schoof, S., *See* Coerdt, W., 12:16430
Schoonen, D.H., *See* Gertz, C.P., 12:15401
See Ruska, M.D., 12:15397
Schor, A.L., *See* Mahannah, J.A., 12:15932
Schora, F.C., *See* Patel, J.G., 12:15275
Schriber, S.O., Factors limiting the operation of structures under high gradient, 12:16528 (R;US)
Schuch, R., Electron ion collisions with a heavy ion cooler ring, 12:17065 (R;US)
The Heidelberg test storage ring for heavy ions and its use for atomic physics, 12:16591 (R;US)
Schuck, P., Random phase approximation, 12:17286 (R;FR)
Schuessler, M., *See* Deinzer, W., 12:16947
Schulke, A.W., *See* Knox, A.E., 12:16542
Schuller, I.K., *See* Locquet, J.P., 12:17354
Schultz, A.J., *See* Whangbo, M., 12:16412
Schultz, J.H., *See* Beck, W.K., 12:17608
See Pillsbury, R.D. Jr., 12:17536
See Thome, R.J., 12:17550
Schultz, K.R., The fusion applications study - FAME, 12:17505 (J;US)
See Engholm, B.A., 12:17506
See Wong, C.P.C., 12:17515
Schultz, P.J., *See* Nielsen, B., 12:16308
Schulz, W., Heating systems, 12:16202 (RA;DE;In German)
See Casser, E., 12:16153
See Kremer, H., 12:15329
See Rodenhaeuser, F., 12:16169
Schutz, R.W., Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Schwander, J., *See* Stauffer, B., 12:16767
Schwarzmeier, J.L., *See* Barnes, D.C., 12:17475
See McKenna, K.F., 12:17474
Schweiner, Z., CSKAE activity in the field of ionizing radiation applications in agriculture and food industry, 12:16845 (RA;CS;In Czech)
Schweizer, W., *See* Bidlingmaier, W., 12:16774
Schwierz, R., *See* Exkstein, P., 12:16557
Scott, D.L., *See* Harker, Y.D., 12:16923
Scott, R.G., *See* Winans, R.E., 12:15300
Scoville, J.J., Economics of disposal at future disposal facilities, 12:15460 (J;US)
Sculthorpe, B.R., Vibration monitoring/ diagnostic techniques, as applied to reactor coolant pumps, 12:15823 (J;US)
Scutaru, H., *See* Iosifescu, M., 12:17374
Sears, R.E., Catalyzed steam gasification of low-rank coals to produce hydrogen, 12:15583 (J;US)
Seckel, D., Inflation in a wall dominated universe, 12:17392 (BA;US)
Sedaghat, A., Diversion cross-flow mixing at the inlet of a simulated rod bundle using a gamma camera, 12:15942 (J;US)
Sedehi, S., *See* Bogart, S.L., 12:17586
Sedlackova, J., Will radiodisinfestation lead to a reduction in pesticide residues in food?, 12:16850 (RA;CS;In Czech)
Seed, T.J., *See* Bogart, S.L., 12:17586
See Miller, R.L., 12:17502
Seeger, P.A., The Low-Q Diffractometer at the Los Alamos Neutron Scattering Center, 12:16648 (R;US)
Seeliger, D., *See* Elfruth, T., 12:17237
See Exkstein, P., 12:16557
See Ignatovich, V.K., 12:17230
See Kalka, H., 12:17266
See Maerten, H., 12:17245, 12:17281
See Meister, A., 12:17251
See Schmidt, D., 12:17214
Seestrom-Morris, S.J., *See* Morris, C.L., 12:17212
Seidel, B.R., Experience with EBR-II [Experimental Breeder Reactor] driver fuel, 12:15979 (R;US)
Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel, 12:16016 (R;US)
See Porter, D.L., 12:15850
Seidel, J.G., *See* Ruddy, F.H., 12:15951
Seidel, K., *See* Elfruth, T., 12:17237
See Ignatovich, V.K., 12:17230
See Meister, A., 12:17251
Seidel, S., *See* Ayres, D.S., 12:17094
Seiler, S.A., *See* Brooks, A.L., 12:16901
Seixas, J., Magnetic monopoles: from classical to quantum physics, 12:17154 (R;FR)
Sekanina, Z., *See* Larson, S., 12:17027
Selby, J.M., *See* Merwin, S.E., 12:17333
Selcow, E.C., Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Seligson, C.H., Electric utility regulation - today and tomorrow, 12:16177 (J;US)
Selitskij, Yu.A., Thermal neutron fission cross-sections of /sup 236/Np isomers, 12:17249 (RA;CS)
Semenoff, G.W., *See* Neuberger, H., 12:17184
Semenov, V.K., *See* Bajshev, I.S., 12:16616
Semenov, V.P., Resolution of spectrometric systems of various types. Problem statement, 12:16610 (R;SU;In Russian)
Sen, A., Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Senjanovic, G., Problem of families, 12:17187 (BA;NL)
Sentis, R., Numerical solution of transport equations with particle correction, 12:17356 (R;FR;In French)
Senum, G.I., A reexamination of the tropospheric methane cycle: Geophysical implications, 12:15365 (BA;US)
Sepaniak, M.J., *See* McGowan, C.W., 12:15374
Serbin, C., *See* Drake, J., 12:15622
Serezhnikov, S.V., Asymptotic solution of transport equation with an arbitrary indicatrix, 12:17313 (RA;SU;In Russian)
Sergachev, A.I., *See* Goverdovskij, A.A., 12:17248
Sergeev, V.A., *See* Zavarzina, V.P., 12:17283
Serio, M.A., *See* Solomon, P.R., 12:15278, 12:15279, 12:15280
Sernelius, B.E., The effects of heavy doping on the electronic states in semiconductors, 12:17340 (R;US)
Serrurier, R., Advanced electrostatic fabric filtration experience at Southwestern Public Service Company, 12:15742 (RA;US)
Setaro, J.A., Medical isotopes at Oak Ridge National Laboratory, 12:16811 (R;US)
Seth, S., Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Setlow, R.B., *See* Freeman, S.E., 12:16882
Settle, J.L., *See* Johnson, I., 12:15965
Sevenhans, W., *See* Locquet, J.P., 12:17354
Sever'yanov, V.M., *See* Elizarov, O.I., 12:16639
Severn, G.D., *See* Brouchous, D.A., 12:17423
Sevigny, G.J., *See* Holton, L.K. Jr., 12:15478
Sevy, R.H., *See* Holland, J.W., 12:15978
Seyedghasemipour, S.J., A stochastic approach to project planning in an R and D environment: Final report, 12:17633 (R;US)
Sgro, A.G., *See* Mirin, A.A., 12:17460
Shack, W.J., BWR pipe crack remedies evaluation, 12:15764 (R;US)
See Kassner, T.F., 12:15766
Shade, J.W., Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Shaer, M., *See* Tsang, F.Y., 12:17526
Shah, Y.M., *See* Price, R.T., 12:15680
Shakudo, T., *See* Domoto, K., 12:15845
Shand, M.L., *See* Sam, R.C., 12:16470
Shannon, T.E., *See* Flanagan, C.A., 12:17493
Shapiro, B.J., *See* Drouin, M.T., 12:16084
Shapiro, S.M., *See* Wong, P.Z., 12:17337
Shappert, L.B., *See* Box, W.D., 12:15800
Sharan, H.N., *See* Becker, M., 12:15618
Sharp, D.J., *See* Boyle, G.A., 12:15665
Sharpe, N., *See* Burgher, L.M., 12:17658
Sharples, J.K., Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack, 12:16291 (R;GB)
Shatyan, S.A., *See* Arutyunyan, V.N., 12:16546

Shavokhina, N.S., *See* Chernikov, N.A., 12:17175
Shaw, R.A., Economic considerations for nuclear power plant LLW, 12:15464 (J;US)
Shaw, R.S., *See* Antoniades, J., 12:17457
See Goldenbaum, G.C., 12:17458
Shchebolev, V.T., *See* Burtsev, V.A., 12:17414
Shchelev, A.S., *See* Elizarov, O.I., 12:16639
Shcherbanyuk, O.P., *See* Ignat'ev, V.V., 12:15836
Sheckherd, J.W., *See* Lucas, G.E., 12:17573
Sheen, S.H., Advanced research in instrumentation and control technology: Acoustic parameter studies, 12:16599 (R;US)
Sheffield, J., Physics guidelines for the Compact Ignition Tokamak, 12:17492 (J;US)
Shelepin, L.A., *See* Mirzoev, F.Kh., 12:16279
Sheline, R.K., *See* Shera. E.B., 12:17224
Shelleman, D.L., *See* Freiman, S.W., 12:16338
Shen, J., *See* Lee, Y.N., 12:16732
Shen, S., Biological engineering for sustainable biomass production, 12:15600 (R;US)
Shency, G.K., Scientific opportunities at the proposed 6-7 GeV Advanced Photon Source, 12:16539 (R;US)
Shepard, K.W., *See* Pardo, R.C., 12:16541
Shepard, M., *See* Miskimin, P.A., 12:15471
Shepherd, K.P., Environmental noise considerations for the siting and operation of wind energy farms, 12:15644 (BA;US)
Shera. E.B., Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
See Wohlfahrt, H.D., 12:17222, 12:17223
Sherman, I.S., *See* Strauss, M.G., 12:16600
Sherman, R.H., *See* Breunlich, W.H., 12:17207
Sheron, B.W., Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Sherwood, E.G., *See* Armstrong, W.T., 12:17470
See Davis, H.A., 12:16497
See Rej, D.J., 12:17469
Shetty, D.K., *See* Wright, I.G., 12:15290
Shevelev, Ya.V., *See* Legasov, V.A., 12:15870
Shibaev, V.D., *See* Balagurov, A.M., 12:16484
Shibaraha, I., *See* Lee, M.J., 12:15980
Shieh, D.R., FRC plasma transport studies with 1-D plus modified Hill's vortex radial profiles, 12:17468 (RA;US)
Shifman, M.A., Instantons versus SUSY, 12:17165 (R;SU)
Shikhov, S.B., *See* Abramov, B.D., 12:17310
Shikiya, J., Interlaboratory study of benzene stability of tedlar bags. Final report, 12:16714 (R;US)
See Kowalski, J., 12:16722
Shimotake, H., *See* Nelson, P.A., 12:16150
Shiralkar, B.S., *See* Chu, K.H., 12:16138
Shire, P., TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)
Shirley, D.A., Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
See Barton, J.J., 12:16323
Shirokov, V.K., *See* Elizarov, O.I., 12:16639
Shiue, C.Y., *See* Arnett, C.D., 12:16816
Shkundenkov, V.N., *See* Borodyuk, V.P., 12:16637
Shlyapnikov, P.V., *See* Azhinenko, I.V., 12:17104
Shoshiashvili, Sh.S., *See* Azhinenko, I.V., 12:17104
Shugars, H.G., Evaluation of alternative techniques for machinery vibration monitoring, 12:15684 (RA;US)
See Stevens, D.M., 12:15946
See Walter, T.J., 12:15687
Shugart, L., Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene, 12:16892 (RA;US)
Shumaker, D.E., Transport simulation of a field-reversed configuration plasma, 12:17477 (RA;US)
Shumejko, N.M., *See* Akhundov, A.A., 12:17152
Shumovskij, A.S., *See* Baldin, A.M., 12:17294
Shuy, G.W., *See* Price, R.E., 12:17587
Shyong, D.Y., *See* Kaufman, I., 12:15707
Siddall, W.F., *See* Davidson, M.J., 12:15702
Sidorenko, V.A., *See* Vishnevskij, V.A., 12:16642
Sidorova, O.V., *See* Zhidkov, E.P., 12:17380, 12:17381
Siegel, R.W., Atomic-defect mechanisms for diffusion in refractory bcc metals, 12:16248 (R;US)
See Fluss, M.J., 12:16307
See Smedskjaer, L.C., 12:16309, 12:16310
Siegelman, H.W., *See* Raps, S., 12:16807
Siemon, R.E., *See* Armstrong, W.T., 12:17470
See McKenna, K.F., 12:17474
See Rej, D.J., 12:17469
See Tuszewski, M., 12:17473
Sienicki, J.J., Corium droplet size in direct containment heating, 12:16139 (J;US)
Sigmund, P., Surface studies by sputtering, 12:17346 (RA;CS)
Sijercic, M., *See* Hanjalic, K., 12:15296
Sikivie, P., Invisible axion detectors, 12:17055 (BA;NL)
Sikora, V., Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)
Sikov, M.R., Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Sills, E.D., Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Sills, H.E., Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Silver, E.G., Nuclear Safety: Technical progress review, January-March 1987, 12:16063 (R;US)
Silvera, I.F., Spin-polarized hydrogen: new limitations on high density, 12:17091 (RA;CS)
Silvestri, G.J. Jr., Operation and design requirements of cyclic steam turbines, 12:15731 (RA;US)
Simakov, S.P., *See* Lovchikova, G.N., 12:17277
Simm, W., *See* Hollenstein, Ch., 12:17412
Simmons, J.A., *See* Wan, E.I., 12:15592, 12:15593, 12:15594
Simmons, R.L., Integral fuel burnable absorber experience in two- and three-loop cores, 12:15956 (J;US)
Simms, R., TREAT source-term experiment STEP-1 simulating a PWR LOCA, 12:16106 (J;US)
Simon, C.J., *See* Tessler, G., 12:15864
Simonov, Yu.A., Multiinstantons and monopoles in SU(2) gluodynamics, 12:17166 (R;SU)
Simons, G.A., *See* Boni, A.A., 12:15328
Simpson, D.E., *See* Brechbiel, M.W., 12:16841
Simpson, J., *See* Ruggiero, A.G., 12:16502
Simpson, R.B., *See* Hoover, M.D., 12:17552
Sims, J.L., *See* Sims, R.C., 12:16221, 12:16222
Sims, R.C., Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)
See McLean, J.E., 12:16776
Simunek, P., *See* Cidlinsky, K., 12:15966
Sing, D., *See* Brouchous, D.A., 12:17423
Singh, G., Palo Verde full-range feedwater control system operating experience, 12:15819 (J;US)
Singh, J.J., Investigation of the effects of cobalt ions on epoxy properties, 12:16363 (R;US)
Singh, K.P., *See* Isobe, T., 12:17039
Singleton, M.F., Assay products from Green River oil shale, 12:15373 (R;US)
Sinton, W.M., *See* Hall, D.N.B., 12:16976
Sioshansi, P., New approach for diagnostic monitoring of wear, erosion and corrosion in utility applications, 12:15704 (RA;US)
Siskind, B., Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Six, N.F., *See* Menietti, J.D., 12:16982
Sjoeblom, R., Postaccident chemical decontamination: Method development: Final report, 12:16030 (R;US)
Sjoreen, A.L., *See* Hively, L.M., 12:15554
See Miller, C.W., 12:15505
Skaperdas, G.T., *See* O'Hare, T.E., 12:15587, 12:15588, 12:15589
Skeen, D.R., *See* Burnside, R.J., 12:15842
See Meriwether, G.H., 12:15841
Skiff, B.A., *See* Bowell, E.L.G., 12:16997

Skinner, D.J., Environmental monitoring requirements during remedial action and stabilization of uranium mill tailings (UMTRA project), 12:15514 (RA;US)
See Meyer, H.R., 12:15510
Skinner, L., *See* Seth, S., 12:16100
Sklad, P.S., *See* Farlow, G.C., 12:16341
Skladany, G.J., Design and construction of a reactor system to model the anaerobic/oxic wastewater treatment system, 12:16835 (RA;US)
Skowronski, R.P., Investigation of coal hydrogenation using deuterium as an isotopic tracer, 12:15308 (BA;US)
Skrydlyak, I.S., *See* Bel'skij, N.P., 12:16515
Slabe, M.E., *See* Gaier, J.R., 12:16362
Slatkin, D.N., *See* Wallwork, J.C., 12:16907
Slawecki, M.A., *See* Wolson, R.D., 12:15384
Sligl, V.R., Nuclear investment and fuel cycle costs. Short and long term evolution of uranium costs. Canadian perspective, 12:15406 (RA;XA)
Slobodien, M.J., *See* Milakovic, J., 12:16598
Slobodien, M.S., *See* Schauss, R.D., 12:15555
Slominski, L., *See* Eskenazi, D., 12:15616
Slough, J.T., Experimental and numerical study of various methods of programmed formation on TRX-2, 12:17463 (RA;US)
See Hoffman, A.L., 12:17464
Smalley, R.E., *See* Heath, J.R., 12:16424
Smedskjaer, L.C., A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
PAS determination of the vacancy formation enthalpy in tungsten, 12:16310 (BA;US)
See Mundy, J.N., 12:16252
See Siegel, R.W., 12:16248
Smee, J.L., Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Smeulders, P., *See* Mueller, E.R., 12:17407
Smidt, D., Automatic path-planning for a multilink articulated boom within the torus of a fusion reactor, 12:17438 (R;DE)
Smirnov, A.Yu., Do multinucleon clusters exist in a nucleus, 12:17262 (R;SU)
See Batunin, A.V., 12:17131
Smirnov, P.S., *See* Sikora, V., 12:17349
Smirnov, Yu.B., *See* Ignat'ev, V.V., 12:15836
Smirnova, L.A., *See* Akopyan, V.P., 12:16527
Smith, A.B., *See* Lawson, R.D., 12:17257
Smith, A.M., *See* Crellin, G.L., 12:15919
Smith, A.R., *See* Mathews, M.A., 12:15347
Smith, B.A., *See* Terrile, R.J., 12:17022
Smith, B.T., *See* Chisholm, G.H., 12:16028, 12:17644
Smith, C.F., *See* Cohen, J.J., 12:15459
See Wickham, L.E., 12:15465
Smith, D.L., Covariances for measured activation and fission ratios data, 12:17256 (R;US)
Status of fusion reactor blanket design, 12:17510 (J;US)
See Bloom, E.E., 12:17627
Smith, D.M., *See* Williams, F.L., 12:15305
Smith, D.R., Pacific Gas and Electric Company's wind energy program results, 12:15649 (BA;US)
Smith, E.J., *See* Sanderson, T.R., 12:16966
See Tsurutani, B.T., 12:16967
Smith, G., *See* Menlove, H.O., 12:16647
See Oddone, P., 12:16654
See Provencher, R., 12:15530
Smith, G.C., *See* Fischer, J., 12:16652
Smith, G.R., *See* Ho, S.K., 12:17419
Smith, H.J., Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Smith, H.V. Jr., Spectroscopic investigation of H^- and D^- ion source plasmas, 12:16564 (R;US)
Smith, I.D., *See* Burrage, L.M., 12:15668
Smith, J.K., *See* Greiner, G.P., 12:16717
Smith, J.L., Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Progress on molten carbonate fuel cell alternative cathodes, 12:16189 (R;US)
See Pierce, R.D., 12:16196
See Zirngiebl, E., 12:16284
Smith, J.V., *See* Box, W.D., 12:15800
See Sutton, S.R., 12:16535
Smith, L.H., *See* Witschi, H.P., 12:16888
Smith, M.R., *See* Arnett, C.D., 12:16816
Smith, R.D., Supercritical fluid chromatography and mass spectrometry, 12:15294 (RA;US)
See Cannon, B.D., 12:16394
Smith, R.P., *See* McCardell, R.K., 12:16025
Smith, R.S., Thermal-hydraulic aspects of flow inversion in a research reactor, 12:15982 (R;US)
Smith, S.T., LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis, 12:15565 (R;US)
Smith, W.H., Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
High resolution spectral imagery of comets, 12:17013 (RA;US)
Smoot, L.D., *See* Hedman, P.O., 12:15281
See Wells, W.F., 12:15303
Smyth, W.H., Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986, 12:17031 (R;US)
Snead, C.L. Jr., Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
Snelgrove, J.L., *See* Deen, J.R., 12:15981
Snow, A.L., Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
Snow, C.C., *See* Andrews, L.M., 12:16182
Snow, D.J., Acoustic leak detection in fossil fueled boilers, 12:15699 (RA;US)
Sobel, H.W., Neutrino oscillations, 12:17134 (RA;CS)
Sober, T.J., *See* Chari, M.V.K., 12:15706
Sobieski, J., Recent experiences in multidisciplinary analysis and optimization, part 1, 12:16437 (R;US)
Sodan, H., *See* Will, E., 12:16629
Soden, R.A., BWR control rod drive scram pilot valve monitoring program, 12:15767 (RA;US)
Soderholm, L.H., Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
Solfer, B.T., Research in planetary astronomy at Palomar Observatory, 12:16990 (RA;US)
Soine, W.H., Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
Sokolov, A.M., POMNK-programme of experimental data approximation by linear combination of functions, 12:17653 (R;SU;In Russian)
Sokolova, N.A., Software of the module of automatic control system by power supply of the U-240 cyclotron, 12:16511 (R;SU;In Russian)
Soldat, J.K., *See* Denham, D.H., 12:15442
Soldatov, V.A., Difference equation of neutron thermalization in vibrational-nonequilibrium medium, 12:17311 (R;SU;In Russian)
Solday, J.K., *See* Gilbert, T.L., 12:15494
Solem, J.G., *See* Rinker, G.A., 12:17351
Solomon, A., *See* Drake, J., 12:15622
Solomon, A.D., *See* Wood, R.F., 12:16370
Solomon, A.M., Simulation experiments with Late Quaternary carbon storage in mid-latitude forest communities, 12:15352 (BA;US)
Solomon, P.R., Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985, 12:15279 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
Solov'ev, V.G., *See* Nesterenko, V.O., 12:17296
Solyany, V.I., Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Som, P., Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
See Lipman, J.J., 12:16884
Sommer, M., Orsay synchrotron radiation sources complex, 12:16579 (RA;US)
SUPER-ACO the new Orsay dedicated synchrotron radiation source, 12:16586 (RA;US)
Sommer, S.N., *See* Budding, K.E., 12:15625
Sommerfield, G.A., *See* Stevens, D.M., 12:15947
Somorjai, G.A., *See* Carrazza, J., 12:15297
Sonoda, H., Energy-momentum tensor on a Riemann surface, 12:17183 (J;NL)
Soper, D.E., *See* Berger, E.L., 12:17124
Sopocy, D.M., *See* Aschoff, A.F., 12:15720
Soppet, W.K., *See* Kassner, T.F., 12:15766
Sorensen, D.L., *See* Sims, R.C., 12:16221, 12:16222

Sorensen, N.R., Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
See Diegle, R.B., 12:16296
Sorini, S.S., *See* Clark, J.A., 12:15375
Southworth, S.H., *See* Shirley, D.A., 12:16531
Soward, A.M., Convection-driven dynamos, 12:16943 (RA;CS)
Spalding, M.H., Model of carbon dioxide assimilation in Chlamydomonas reinhardii, 12:16810 (J;DE)
Spampinato, P.T., Maintainability features of the Compact Ignition Tokamak, 12:17570 (J;US)
Maintenance features of the Compact Ignition Tokamak fusion reactor, 12:17432 (R;US)
See Flanagan, C.A., 12:17493
Spanne, P., Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
Spaulding, W.G., Last pluvial climatic episodes in the deserts of southwestern North America, 12:16696 (J;GB)
Speck, J., *See* Steinbeck, J., 12:17352
Speer, D.R., Decontamination and decommissioning of contaminated surplus facilities in the 200 areas of the Hanford site, 12:15545 (RA;US)
See Hale, V.Q., 12:15503
Speight, J.G., Upgrading heavy feedstocks, 12:15361 (J;US)
Spencer, B.W., *See* Sienicki, J.J., 12:16139
Spencer, E.G., *See* Croft, M., 12:16303
Spencer, J.W., *See* Stevens, D.M., 12:15946, 12:15947
Sperduti, A., *See* Paul, S.F., 12:17443
Sperling, J.L., *See* Hamasaki, S., 12:17476
Spiekerman, G., *See* Behringer, K., 12:15925
Spiller, E., *See* Bartlett, R.J., 12:16324
Spinrad, H., Spatially resolved quantitative spectroscopy of comets, 12:17014 (RA;US)
Spirlet, J.C., *See* Lander, G.H., 12:16313
Spitulnik, J.J., New approaches to performance-based project management training, 12:15922 (J;US)
Spivey, J.J., *See* Goodfellow, H.D., 12:16703
Spooner, S., Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy, 12:16304 (J;US)
Springer, D.L., Effects of complex organic mixtures of coal liquid on cardiovascular function, 12:15338 (RA;US)
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)
See Bean, R.M., 12:16896
See Dankovic, D.A., 12:15335
See Lucke, R.B., 12:15291
See Mahlum, D.D., 12:15337
Springer, G., Origins of the Messel oil shale and structure of petroporphyrins, 12:15372 (R;DE;In German)
Sproull, R.D., *See* Krishna, C.R., 12:15269
Spurgin, A.J., Benchmark of systematic human action reliability procedure, 12:16068 (J;US)
Srinivasachar, S., *See* Boni, A.A., 12:15328
Srinivasan, M.G., *See* Doss, E.D., 12:15323
See Kot, C.A., 12:16019
Srinivasan, M.R., Economic case for small and medium power reactors in India, 12:15872 (RA;XA)
Srinivasan, V.S., *See* Joshi, N.B., 12:16035
Srivastava, P.C., *See* Knapp, F.F. Jr., 12:16813
Srivastava, V., Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
Srivastava, V.J., *See* Rue, D.M., 12:15274
Stacey, W.M. Jr., International Tokamak Reactor (INTOR), 12:17495 (J;US)
Staelin, D.H., Analysis of Jovian decametric data: study of radio emission mechanisms, 12:16991 (RA;US)
Stahl, D., *See* Becker, M., 12:15618
Stakowski, R., Commercial bank contribution in the financing of nuclear plant export contracts, 12:15902 (RA;XA)
Stamoudis, V.C., Complex mixtures: comparative chemical and toxicological characterization, 12:15336 (RA;US)
Stanford, G.S., *See* Devolpi, A., 12:16014
Starling, K.E., Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986, 12:15304 (R;US)
Starrfield, S.G., *See* Cox, A.N., 12:16963
Stassis, C., *See* Vrtis, M.L., 12:17339
Stauffer, B., Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
See Oeschger, H., 12:16746
Stearns, J., Solar Stirling receiver alternatives for the terrestrial solar application, 12:15619 (R;US)
Stearns, J.W., *See* Schlachter, A.S., 12:17081
Stecker, F.W., *See* Gaisser, T.K., 12:17037
Steele, O.P., *See* Lutton, J.M., 12:15852
Steeley, W.J., *See* Smith, D.R., 12:15649
Steffen, R.M., *See* Shera. E.B., 12:17224
See Wohlfahrt, H.D., 12:17222, 12:17223
Stegajlov, V.I., *See* Abrosimov, V.N., 12:16632
Stehlik, M., *See* Benko, G., 12:16962
Steigelmann, W.H., Winning the rate base battle, 12:16176 (J;US)
Steiman-Cameron, T.Y., Chromospheric activity of cool giant stars. Final report, 12:17030 (R;US)
Steinbeck, J., Analysis of picosecond pulsed laser melted graphite, 12:17352 (R;US)
Steinberg, M., *See* Cheng, H.C., 12:16730
Steinberg, R.I., Non-accelerator particle physics: Progress report for period February 1, 1986-January 31, 1987, 12:17100 (R;US)
Steiner, D., Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)
See Duggan, W.P., 12:17498
See Embrechts, M.J., 12:17594
See O'Brien, D.A., 12:17600
Steinhardt, P.J., *See* Ovrut, B.A., 12:17390
Steinhauer, L.C., Flux trapping during field reversal in the formation of a field reversed configuration, 12:17465 (RA;US)
See Hoffman, A.L., 12:17464
Steinolfson, R.S., Reverse flow and current filamentation in the nonlinear tearing mode, 12:17403 (RA;CS)
Stenner, R.D., Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system, 12:15557 (RA;US)
See Denham, D.H., 12:15442
See Kennedy, W.E. Jr., 12:15443
Stepanov, A.V., *See* Zavarzina, V.P., 12:17283
Stepantsov, S.V., *See* Eremin, A.V., 12:16640
Steunenberg, R.K., *See* Burris, L., 12:15383
Stevens, D.J., Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement, 12:15610 (R;US)
Stevens, D.M., Monitoring and diagnostic system for reactor coolant pump seals, 12:15947 (RA;US)
Reactor coolant pump seal leakage monitoring, 12:15946 (RA;US)
Stevens, R.R. Jr., Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Stevenson, B., Green's function for the evaluation for neutron cross sections, 12:15939 (J;US)
Stewart, D.L., *See* Pelroy, R.A., 12:15343
See Wright, C.W., 12:15295
Stewart, J., *See* Enssling, N., 12:16663
Stewart, J.A. III, Demonstration of a remotely operated TRU waste size-reduction and material handling process, 12:15484 (J;US)
Stewart, J.E., Hybrid Monte Carlo/analytical model of neutron coincidence counting, 12:16665 (J;US)
Stimmel, J.R., *See* Marchetti, S., 12:15529
Stingley, R.M., *See* West, L., 12:15579
Stoakley, D.M., *See* Singh, J.J., 12:16363
Stock, J., Integrating wind energy into the electric utility system, 12:15646 (BA;US)
Stockli, M.P., *See* Schlachter, A.S., 12:17081
Stoddard, F.S., Structural dynamics considerations in wind turbine rotor design, 12:15653 (BA;US)
Stodola, J., Phosphate and other hide-out, 12:15734 (RA;US)
Stoenner, R.W., *See* Walsh, J.J., 12:16786
Stokes, G.M., Presentation of the 20th century atmospheric CO_2 record in Smithsonian spectrographic plates, 12:16744 (BA;US)
Stolzman, B., *See* Cowen, J.A., 12:16255
Stone, D.M., *See* Powers, H.R. Jr., 12:16886
Stone, J.A., *See* Wicks, G.G., 12:16356
Stone, T.A., *See* Woodwell, G.M., 12:16780
Storm, D.W., *See* Lu, J.Q., 12:16522
Stosur, J.J.G., Potential of enhanced oil recovery, 12:15357 (J;GB)
Stoto, T., Irradiation damage in boron carbide: point defects, clusters and helium bubbles, 12:16325 (R;FR)
Stoyanov, S., *See* Chu, T.L., 12:16098
Stradley, J.G., *See* Feldman, M.J., 12:15389

Straede, Ch., /sup 235/U(n,f) fragment mass, kinetic energy and angular distributions at energies below 6 MeV - results and interpretation, 12:17246 (RA;CS)
Strain, R.V., *See* Akers, D.W., 12:16024
See Bottcher, J.H., 12:15977
See Einziger, R.E., 12:15400
See Lee, M.J., 12:15980
Strange, J.E., Low-leakage fuel management in Sequoyah, 12:15806 (J;US)
Strauss, M.G., CCD[charge-coupled device]-based synchrotron x-ray detector for protein crystallography: Performance projected from an experiment, 12:16600 (R;US)
Streb, A.J., Energy savings in the industrial sector - An overview, 12:16223 (BA;US)
Street, R.A., *See* Perez-Mendez, V., 12:16655
Streib, W.E., *See* Chamberlain, L.R., 12:16409
Strel'tsov, V.N., On permissible space anisotropy, 12:17379 (R;SU;In Russian)
Stringfield, R.M., *See* Davis, H.A., 12:16497
Strittmatter, R.B., *See* Campbell, K., 12:15564
Strom, S.E., Jets, mass outflows and disks associated with young stellar objects, 12:17021 (RA;US)
Strongin, M., *See* Ruckman, M.W., 12:16241
Stropki, J.T., *See* Wright, I.G., 12:15290
Stroud, P., Heavy ion beam transport in ICF reaction chambers, 12:17619 (J;US)
Strunc, A., Finite element calculation of dynamic behaviour of filled tanks, 12:16048 (RA;CS;In Czech)
See Masopust, R., 12:16047
Strzepa, P., *See* Ritter, J.E., 12:16330
Stuiver, M., Ancient carbon cycle changes derived from tree-ring ^{13}C and ^{14}C, 12:16747 (BA;US)
Stulen, F.B., Critical review of acoustic and acoustic emission leak detection in boilers, 12:15701 (RA;US)
Stumpe, R., Laser Induced Photoacoustic Spectroscopy for the oxidation specific determination of actinoids in solution, 12:16388 (R;FR;In German)
Sturla, P., Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service, 12:15730 (RA;US)
Stutzke, M.A., New time-line technique for station blackout core-melt analysis, 12:16122 (J;US)
Su, Y., *See* Zhang, Y., 12:16585
Sudan, R.N., *See* Schamiloglu, E., 12:17480
Sudarsky, D., *See* Fischbach, E., 12:17126
Suding, P.H., *See* Casser, E., 12:16153
Suenaga, M., *See* Snead, C.L. Jr., 12:16311
Sugano, K., Properties of gluon jets, 12:17095 (R;US)
Sulak, L.R., *See* Ayres, D.S., 12:17094
Sulc, V., Advances in sodium technology, testing and diagnostics of fast reactors, 12:15856 (R;CS;In Czech and Russian)
Sullivan, M.F., Neptunium-237 inhalation in rats, 12:16880 (J;US)
Sullivan, R.J., Stainless steel decontamination manipulators, 12:15479 (J;US)
Summers, L.T., *See* Miller, J.R., 12:17606
Sun, J.D., *See* Bond, J.A., 12:16890
See Wolff, R.K., 12:16894
Sun Hong, Control system for the MNSR, 12:15958 (RA;XA)
Sundquist, E.T., Geologic analogs: their value and limitations in carbon dioxide research, 12:16753 (BA;US)
Sundstrom, E., *See* Draper, J.V., 12:16453
Sung, W.K., DNA synthesis studies in pre-meiotic mouse oogenesis, 12:16842 (J;CH)
Surenko, V.I., *See* Ignat'ev, V.V., 12:15836
Surma, J.E., *See* Holton, L.K. Jr., 12:15478
Sushkov, A.V., *See* Nesterenko, V.O., 12:17296
Sutherland, B.M., *See* Freeman, S.E., 12:16882
Sutherland, D., Factors affecting growth inhibition of enteric bacteria by methyl α-D-glucoside, 12:16836 (RA;US)
Sutherland, J.C., *See* Freeman, S.E., 12:16882
Sutherland, M., *See* Godfrey, P.J., 12:16783
Sutton, S.R., Applications of synchrotron x-ray fluorescence to extraterrestrial materials, 12:16535 (R;US)
See Hanson, A.L., 12:16534
Suuberg, E.M., Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Sviatoslavsky, I., *See* Kulcinski, G.L., 12:17625
Sviatoslavsky, I.N., Thin blanket design for MINIMARS - A compact tandem mirror fusion reactor, 12:17511 (J;US)
Svin'in, M.P., *See* Al'bertinskij, B.I., 12:16514
Svoboda, T., *See* Bondy, R., 12:16847
Swanson, R., Nuclear decommissioning - the financial R & R problems, 12:15905 (J;US)
Swartz, L.E., *See* Bachrach, R.Z., 12:16570
Swartzman, D., *See* Christoffel, T., 12:16163
Swinth, K.L., Beta measurement evaluation and upgrade, 12:16876 (RA;US)
See McDonald, J.C., 12:16874
Szabo, I., *See* Probst, P., 12:16008
Szafer, A., *See* Fischbach, E., 12:17126
Sze, D.K., Conceptual design of a self-cooled FLIBE blanket, 12:17514 (J;US)
Fusion blanket inherent safety assessment, 12:17547 (J;US)
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)
See Abdou, M., 12:17529
See Finn, P.A., 12:17612
See Hassanein, A.M., 12:17611
See Klein, A.C., 12:17576
See Smith, D.L., 12:17510
See Tillack, M.S., 12:17530
Sztaricskai, T., *See* Anriashin, A.V., 12:16627

T

Taeymans, A., *See* Voorde Van de, N., 12:15428
Tagirov, Eh.A., Parametric transformation of weak gravitational wave into electromagnetic one in a three-level system, 12:16959 (RA;SU;In Russian)
Tajima, T., Simulation of ion cyclotron resonance heating through resonant absorption in two-ion species plasma, 12:17401 (R;US)
Takahashi, P.K., *See* Neill, D.R., 12:15647
Takehiko, I., ISSP-KEK new light source project, 12:16506 (RA;US)
Takei, K., Steady-sate and load-follow characteristics of various BWR fuel designs, 12:15783 (J;US)
Takeuchi, K., Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Takhtamyshev, G.G., *See* Kalinovskij, Yu.L., 12:17145
See Kazachenko, O.N., 12:17650
Talebizadeh, M.A., *See* West, L., 12:16000
Tallant, D.R., Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)
Tallent, O.K., Prediction of critical grout parameters: critical flow rate, 12:15469 (J;US)
See McDaniel, E.W., 12:15414
Talmadge, C., *See* Fischbach, E., 12:17126
Tanaka, J., Photon factory, 12:16505 (RA;US)
Tang, P., Processor self-scheduling for multiple-nested parallel loops, 12:17665 (BA;US)
Tang, Y.K., *See* Kot, C.A., 12:16019
Tapia Garcia, F., Retrospective economic and financial analysis of the Laguna Verde Project, 12:15892 (RA;XA)
Tarabrin, V.A., *See* Eremin, A.V., 12:16640
Taran, Yu.V., *See* Elizarov, O.I., 12:16639
Tarasen, W.L., *See* Lutz, G.R., 12:17582
Tarasov, O.V., *See* Ermushev, A.V., 12:17159
Tarman, P.B., *See* Patel, J.G., 12:15275
Tarnero, M., *See* Auchapt, P., 12:15379
Tarnok, T.D., *See* Chen, Y., 12:15744
Tarpinian, J.E., *See* Merchant, D.J., 12:16010
Tarwater, A.E., *See* Margolin, L.G., 12:17659
Taschini, A., *See* Giaquinto, L., 12:15659
Tatchyn, R., Optimum undulator trajectories, 12:16532 (BA;US)
See Bachrach, R.Z., 12:16570
Taubert, G., Field of application of cogeneration plants with large engines, 12:15673 (RA;DE;In German)
Tavassoli, A.A., Principal modes of rupture encountered in expertise of advanced components, 12:16245 (R;FR;In French)
Taylor, D.A., *See* Boyle, G.A., 12:15665
Taylor, W.R., *See* Komhyr, W.D., 12:16762
Teller, E., The fusion-fission hybrid, 12:17626 (BA;US)
Teng, J.T., *See* Cheung, Y.K., 12:16092

Tennie, M., *See* Zeitzchel, G., 12:15396
Ter-Akopyan, G.M., *See* Eremin, A.V., 12:16640
Terenetskij, O.K., *See* Verbitskij, V.P., 12:17297
Terhorst, W., Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Terigi, R., Financial problems of nuclear programmes. The experience of Argentina, 12:15891 (RA;XA)
Terpilak, M.S., *See* Osborne, T.W., 12:15541
Terrile, R.J., Planetary optical and infrared imaging, 12:17022 (RA;US)
Teske, R.G., Observational study of ion-electron equilibration and of cloud evaporation in supernova remnants under the HEAO-2 guest investigator program. Final project report, 1 June 1985-30 September 1986, 12:17036 (R;US)
Tessler, G., Qualification of an LWBR-irradiated fuel assay gauge, 12:15864 (J;US)
Teuscher, D.R., *See* Christensen, A.B., 12:15472
Tevikyan, R.V., Gravitation and vacuum field, 12:17359 (R;SU;In Russian)
Tewari, S.N., Primary arm spacing in chill block melt spun Ni-Mo alloys, 12:16288 (R;US)
Thakoor, A.P., *See* Khanna, S.K., 12:17342
Tharp, M.L., *See* Solomon, A.M., 12:15352
Theofanous, T.G., Thermal hydraulics in undergraduate nuclear engineering education, 12:15937 (J;US)
Theus, G.J., Primary side stress corrosion cracking and remedial measures, 12:15809 (J;US)
Thevenot, G., *See* Lefevre, F., 12:17429
Thieberger, P., *See* Jones, K.W., 12:16533
Thomas, B.D., *See* Massey, J.V., 12:15808
Thomas, B.L., *See* Bean, R.M., 12:16896
Thomas, G.E., Thin film coatings which inhibit spin relaxation of polarized potassium atoms, 12:16538 (R;US)
Thomas, J.R., *See* Edlund, M.C., 12:15822
Thomas, N.M., *See* Holton, L.K. Jr., 12:15478
Thomas, P., *See* Hu Erbang, 12:16687
Thomas-Betts, A., *See* Wheildon, J., 12:15628
Thome, R.J., Survey of selected magnet failures and accidents, 12:17550 (J;US)
See Pillsbury, R.D. Jr., 12:17536
Thomlinson, W.C., *See* Jones, K.W., 12:16533
Thompson, D.H.P., *See* Hurst, J.K., 12:16425
Thompson, D.J., Origins, and the construction, commissioning and operation of the SRS, 12:16574 (RA;US)
Thompson, J.D., Transuranic waste disposal in the United State, 12:15454 (J;US)
See Willis, J.O., 12:16285
See Zirngiebl, E., 12:16284
Thompson, M.E., σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Thompson, M.L., *See* Aitken, E.A., 12:15911
Thompson, S., On the use of CORLIB subroutines for the solution of a model fluid flow problem, 12:17655 (R;US)
Thomson, J.D., *See* Milewski, A.J., 12:15983
Thoning, K.W., *See* Komhyr, W.D., 12:16762
Thorne, R.M., *See* Tsurutani, B.T., 12:16967
Thornton, J.R., *See* Snow, A.L., 12:15807
Thunborg, S., Robotic system for remote maintenance of a pulsed nuclear reactor, 12:16002 (J;US)
Thury, M., Exploratory borehole Boettstein: Investigation report. Text volume, 12:15430 (R;CH;In German)
Tian, J., *See* Liu, N., 12:16581
Tice, R.R., Environmental biomonitoring with feral rodent species, 12:16900 (RA;US)
Tielens, A.G.G.M., *See* Allamandola, L.J., 12:16941
Tien, T.Y., *See* Brog, T.K., 12:16337
Tiernan, T., *See* Halvorson, H.O., 12:16839
Till, J.E., Simplified pathway analysis approach for establishing limits for soil contamination, 12:15508 (RA;US)
Tillack, M., *See* Abdou, M., 12:17529
Tillack, M.S., Required momentum, heat, and mass transport experiments for liquid metal blankets, 12:17530 (J;US)
Timpe, R.C., *See* Sears, R.E., 12:15583
Tischler, J.Z., Time-resolved x-ray studies during pulsed-laser irradiation of Ge, 12:16306 (J;US)
Tisinger, R.M., *See* Smith, S.T., 12:15565
Titov, V.A., *See* Burtsev, V.A., 12:17414
Titus, G.L., Financial risk assessment for nuclear generation expansion planning. A utility view, 12:15839 (RA;XA)
Titzler, P.A., Evaluation of glovebox sectioning using weld splitting techniques, 12:16458 (J;US)
Tiwari, S.N., *See* Gormsen, B.B., 12:16706
Tkachuk, I.P., *See* Vishnevskij, V.A., 12:16642
Tobin, M.T., The Compact Torus Accelerator: A driver for ICF, 12:17560 (J;US)
Toburen, L.H., Double differential ionization cross sections, 12:17314 (RA;US)
See DuBois, R.D., 12:17319
See Miller, J.H., 12:17317
Todd, M.J., Activities report in space tribology. Progress report, 1985, 12:16436 (R;GB)
Todd, P., *See* Nelson, J.M., 12:16799, 12:16815
Todd, T.J., Surface contouring with a range finder, 12:16812 (R;US)
Toennies, J.P., Time of flight experiments of the and H/sup +/ scattered from molecules and solid surfaces, 12:17072 (RA;CS)
Toepfer, K., Waste management concept for the south western and southern Palatinate, 12:16226 (RA;DE;In German)
Toepfer, U., Experimental investigations of the reaction between albite and acid hydrothermal solutions, 12:15629 (R;DE;In German)
Toffer, H., *See* Burnside, R.J., 12:15842
Tollaksen, S.L., *See* Zhang, J.S., 12:16795
Tolman, E.L., *See* McCardell, R.K., 12:16025
Tomachevsky, E.G., Validation study of the intertran model for assessing risks of transportation accidents: Road transport of uranium hexafluoride, 12:15489 (R;FR)
Tomczuk, Z., *See* Wolson, R.D., 12:15384
Tomlinson, J., *See* Drake, J., 12:15622
Tong, F., *See* Daneu, 12:16462
Tong, G.T., *See* McCarty, J.G., 12:15284
Tonkov, V.Yu., *See* Solyany, V.I., 12:16021
Tonn, B., An experiment in combining estimates of uncertainty, 12:16913 (R;US)
Tonolini, F., *See* Famiglietti, M., 12:15700
Torardi, C.C., Further aspects of the structure and magnetism of the layered compound $Fe(III)ClMoO_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
Toth, A., *See* Foeldy, L., 12:17383
See Hrasko, P., 12:17384
Toulemonde, M., *See* Dural, J., 12:16536
Tousset, J., *See* Moncoffre, N., 12:16286
Townshend, J.R.G., *See* Tucker, C.J, 12:16779
Trabalka, J.R., Changing carbon cycle: a global analysis, 12:16737 (B;US)
Changing carbon cycle: a global analysis, 12:16741 (B;US)
Tracy, J.G., Stable isotope customer list and summary of shipments, FY 1986, 12:16408 (R;US)
Trafton, L.M., *See* Smith, H.J., 12:16988
Traugor, J.T., Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Trela, W.J., *See* Bartlett, R.J., 12:16324
Trester, P.W., *See* Hopkins, G.R., 12:17572
Tretyak, B.I., *See* Zdesenko, Yu.G., 12:17226
Trewhella, J., *See* Seeger, P.A., 12:16648
Trexler, D.T., *See* Flynn, T., 12:15627
Tripet, J.P., *See* Resele, G., 12:15434
Triplett, J.R., *See* Barlow, T.A., 12:17326
Trishin, V.V., *See* Vishnevskij, V.A., 12:16642
Troshenkova, I.A., *See* Aznauryan, I.G., 12:17259
Trubatch, S.L., Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Problems of interpretation in implementing the low-level waste act, 12:15470 (J;US)
Trubey, D.K., New buildup factor data for point kernel calculations, 12:16450 (J;US)
Truesdale, C.M., *See* Shirley, D.A., 12:16531
Trufanov, A.M., *See* Lovchikova, G.N., 12:17277
Trykov, L.A., *See* Semenov, V.P., 12:16610
Tsakanov, V.M., Space-angular distribution of Synchrotron radiation power in electron storage rings with account of betatron oscillations, 12:16592 (R;SU;In Russian)
Tsang, C.F., Coupled processes in single fractures, double fractures and fractured porous media, 12:16919 (R;US)

Tsang, F.Y., Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)
See File, J., 12:17524
Tsang, K.L., Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Tsang, S., *See* Yashan, D., 12:16295
Tsaur, B.Y., Assessment of silicon-on-insulator technologies for VLSI (very large scale integration), 12:16486 (R;US)
Tschulik, A., *See* Beuttenmuller, R., 12:16660
Tseng, P.K., *See* Chang, C., 12:16582
Tsepakin, S.G., *See* Al'bertinskij, B.I., 12:16514
Tsou, G., *See* Kowalski, J., 12:16722
See Shikiya, J., 12:16714
Tsuji, M., *See* Ohta, M., 12:16117
Tsurutani, B.T., Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
Tucholke, D., *See* Ishii, M., 12:16018
Tucker, C.J, Continental and global scale remote sensing of land cover, 12:16779 (BA;US)
Relationship between atmospheric CO_2 variations and a satellite-derived vegetation index, 12:16736 (J;GB)
Tulinov, A.F., *See* Dem'yanov, A.V., 12:16512
Tullis, D.L., *See* Banerjee, S., 12:16909
Tumbleson, M.E., Swine in biomedical research. Vol. 3, 12:16793 (B;US)
Tummillo, A.F., *See* DeLuca, W.H., 12:16149
Tupin, E.A., *See* Osborne, T.W., 12:15541
Turashvili, K.Sh., *See* Arbuzov, B.A., 12:17163
Turinsky, P.J., *See* Comes, S.A., 12:15907
Turkiewicz, J., *See* Augustyniak, W., 12:17228
Turner, A.D., *See* Chamberlain, H.E., 12:15429
Turner, L.R., Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
See Hua, T.Q., 12:17584
Turner, V.C., *See* Smee, J.L., 12:15768
Turzo, I., *See* Pivarc, J., 12:16509
Tuszewski, M., Axial dynamics in field-reversed theta-pinches, 12:17471 (RA;US)
FRX-C/T large source modification, 12:17473 (RA;US)
See Armstrong, W.T., 12:17470
See McKenna, K.F., 12:17474
See Rej, D.J., 12:17469
Tuten, J.M., Diagnostic monitoring of axial flow fan bearings, 12:15688 (RA;US)
Tutter, M., Method to measure the suprathermal density distribution by electron cyclotron emission, 12:17406 (R;DE)
Tutu, N., *See* Ginsberg, T., 12:16141
Tzanos, C.P., Validation of an intermediate heat exchanger model for real-time analysis, 12:15859 (J;US)
Tzeng, N.F., *See* Yew, P.C., 12:17673

U

Uchida, M., *See* Takei, K., 12:15783
Uckan, N.A., *See* Sheffield, J., 12:17492
Uckan, T., *See* Hillis, D.L., 12:17415
Udivichenko, S.Yu., *See* Karbushev, N.I., 12:16525
Udseth, H.R., *See* Cannon, B.D., 12:16394
See Smith, R.D., 12:15294
Uhland, D.W., 1986 annual water quality data report for the Waste Isolation Pilot Plant, 12:15488 (R;US)
Ukai, S., *See* Bottcher, J.H., 12:15977
Ullrich, J., *See* Schlachter, A.S., 12:17081
Umehara, H., *See* Takei, K., 12:15783
Underhill, S., *See* Hall, C.A.S., 12:16765
Unholzer, S., *See* Elfruth, T., 12:17237
Unruh, C.M., Effluent monitoring systems at Department of energy facilities, 12:16777 (RA;US)
Unruh, W.P., *See* Abraham, M.M., 12:16343
Usmar, S.G., Annealing of cold worked hypostoichiometric Ni_3Al alloys using positron lifetime spectroscopy, 12:16240 (R;US)
Uvarov, V.A., *See* Azhinenko, I.V., 12:17104

V

Va'vra, J., Review of wire chamber aging, 12:16656 (J;NL)
Vacek, K., Proposal for imported fish meal radicidation, 12:16852 (RA;CS;In Czech)
Vacik, J., *See* Peterka, F., 12:16043
Vainstejn, A.I., *See* Shifman, M.A., 12:17165
Vaissiere, P. de, Nuclear power plants and project finance, 12:15897 (RA;XA)
Vajshvila, Z., *See* Bal'butsev, E.B., 12:17295
Vakili, J.E., *See* Oschman, K.P., 12:16924
Valach, M., *See* Pazdera, F., 12:16033
Valenta, V., Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 2, 12:15927 (RA;CS;In Czech)
Vallario, E.J., *See* Merwin, S.E., 12:17333
Vallem, R.J., *See* Distenfeld, C.H., 12:15506
Vallen, R., *See* Inoyatov, A.Kh., 12:16636
Van Camp, F., *See* Ryckbosch, D., 12:17274
Van Dasler, H.C., Research on and applications of non-linear costs functions in the Dutch energy models SELPE and DELPE, 12:16152 (R;NL;DU)
Van de Vyver, R., *See* Ryckbosch, D., 12:17274
Van Den Dool, H.M., Geographical distribution and seasonality of persistence in monthly mean air temperatures over the United States, 12:16697 (J;US)
Van Dyck, R.S. Jr., Atomic physics 9, 12:17085 (B;SG)
Van Echo, A., On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)
Van Houten, N.C., *See* Kennedy, W.E. Jr., 12:15443
Van Konynenburg, R.A., *See* Ebert, W.L., 12:15413
Van Mulders, E., *See* Vanderborck, Y., 12:16273
van Niekerk, H.R., *See* Anderson, R.B., 12:16233
Van Otten, P., *See* Ryckbosch, D., 12:17274
Vanbrabant, R., *See* Voorde Van de, N., 12:15428
Vanderborck, Y., Comparison of material property specifications of austenitic steels in fast breeder reactor technology, 12:16273 (R;FR)
Vanhoutteghem, P., Project financing. Financial planning model (FINPLAN), 12:15899 (RA;XA)
Vanosdell, D.W., Study of electrostatically stimulated filtration fundamentals, 12:15739 (RA;US)
Varsamis, G., *See* Embrechts, M.J., 12:17594
See Steiner, D., 12:17516
Vasek, T., *See* Jursova, L., 12:16628
Vasil'chenko, V.G., *See* Baldin, B.Yu., 12:16613
Vasilevskij, M.A., *See* Arsent'ev, V.N., 12:17485
Vasvary, L., *See* Anriashin, A.V., 12:16627
Vaughn, G.E., Striving for excellence, 12:15921 (J;US)
Vecsernyes, P., Comment to the reanalysis of the Eoetvoes experiment, 12:17382 (R;HU)
Veeder, G.J., Physical properties of asteroids, 12:17015 (RA;US)
Vehanen, A., *See* Nielsen, B., 12:16308
Veidenbaum, A.V., A compiler-assisted cache coherence solution for multiprocessors, 12:17661 (BA;US)
Veluri, V.R., *See* Wynveen, R.A., 12:15495
Venkateswaran, G., *See* Momin, A.C., 12:16399
Venkateswaran, S.R., Fuel cost impacts of using constant cycle-based amortization rates, 12:15906 (J;US)
Verbitskij, V.P., Deuteron break up in Coulomb field of nuclei, 12:17297 (R;SU;In Russian)
Verdingh, V., *See* Berthelot, C., 12:16386
Veretennikov, G.A., Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)
Vernetson, W.G., Revitalization of reactor usage through reactor sharing, 12:15999 (J;US)
See Welch, G.E., 12:15831
Veselov, A.I., *See* Kalashnikova, Yu.S., 12:17287
Vesper, B.E., Johnston Atoll site cleanup - some practical concerns, 12:15521 (RA;US)
Johnston Atoll cleanup - accurate monitoring for actinides, 12:15528 (RA;US)
Vest, R.W., Ink jet printing of silver metallization for photovoltaics: Final technical report for the period 10/1/84 through 9/30/86, 12:15607 (R;US)
Vetter, W.M., *See* Sen, A., 12:16413
Veverka, E.F., *See* Burrage, L.M., 12:15668
Viccaro, P.J., *See* Shency, G.K., 12:16539
Vignier, D., *See* Livet, J., 12:16428
Villarreal, R., *See* Pahl, R.G., 12:15848

Vincent, W.S., Microbial selection in an artificial ecosystem, 12:16838 (RA;US)
Vincour, J., *See* Bem, P., 12:17278
Viner, A., *See* Greiner, G.P., 12:15311
Viner, A.S., Computer monitoring of pilot plant baghouse performance, 12:15750 (RA;US)
See Ensor, D.S., 12:15746
See Hovis, L.S., 12:15743
See Vanosdell, D.W., 12:15739
Vishnevskij, V.A., Automation correlation installation on-line with a computer, 12:16642 (R;SU;In Russian)
Visser, W., Experimental and theoretical studies of reverse combustion in porous media, 12:15331 (BA;US)
Vlases, G.C., *See* Hahn, K.D., 12:17467
Vlasov, A.A., Gravitational collapse in relativistic theory of gravitation, 12:17362 (R;SU;In Russian)
Vo-Dinh, T., Monitoring exposure to polynuclear aromatic compounds via room temperature phosphorescence from solid substrates, 12:15345 (J;GB)
Voborsky, J., Seismic load calculation for primary circuit of Dukovany Nuclear Power Plant, 12:16053 (RA;CS;In Czech)
Voelk, H.J., Shock wave acceleration, 12:16956 (RA;CS)
Vogelsang, W.F., *See* Sviatoslavsky, I.N., 12:17511
Vogg, H., Technical requirements on refuse-fuelled heat- and-power plants, 12:15669 (RA;DE;In German)
Vogt, O., *See* Lander, G.H., 12:16313
Vogt, S., *See* Hu Erbang, 12:16688
Voilleque, P.G., Dose guidelines for decontamination and decommissioning projects, 12:15493 (RA;US)
Vol'f, E.A., *See* Azhinenko, I.V., 12:17104
Volkov, A.A., *See* Baldin, B.Yu., 12:16613
Volkov, G.G., *See* Liparteliani, A.G., 12:17162
Volkov, M.K., Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
Voloshin, M.B., *See* Okun, L.V., 12:17143
Voloshin, M.V., Once again about the role of gluonic mechanism in interaction of light Higgs boson with hadrons, 12:17144 (R;SU)
von Goeler, S., *See* Ellis, R. Jr., 12:17439
See Paul, S.F., 12:17443
Voorde Van de, N., High-temperature incineration of radioactive waste. Exploitation of the FLK-60 slagging incinerator for the treatment of different waste streams contaminated with plutonium, 12:15428 (R;FR)
Vorob'ev, I.I., Some topological characteristics of π/sup -/meson interactions with nuclei, 12:17199 (R;SU;In Russian)
Vorogushin, M.F., *See* Bel'skij, N.P., 12:16515
Vorontsov, I.A., *See* Aref'ev, A.S., 12:17197
Voth, M.H., Modeling the economics of LLW volume reduction, 12:15462 (J;US)
Vrtilkova, V., *See* Pazdera, F., 12:16033
Vrtis, M.L., Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)
Vulov, Ts., *See* Inoyatov, A.Kh., 12:16636
Vuorinen, A., Factors influencing capital costs of nuclear power plant in Finnish conditions, 12:15888 (RA;XA)
Vyskochil, S., *See* Butenko, V.A., 12:16630

W

Wackerle, J.D., *See* Dick, J.J., 12:16680
Wade, J.E., Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon, 12:15640 (BA;US)
Wadlington, M., TUGCO's turbine environment index, 12:15721 (RA;US)
Waganer, L.M., Heavy ion fusion systems assessment - An overview, 12:17621 (J;US)
See Harris, D.B., 12:17558
See Zuckerman, D.S., 12:17620
Wagemans, C., *See* Schillebeeckx, P., 12:17247
Wagner, A.F., *See* Harding, L.B., 12:16435
Wagner, C.E., Compact fusion engineering research facility based upon the LITE concept, 12:17500 (J;US)
Free electron masers for tokamak applications, 12:17542 (J;US)
See Bogart, S.L., 12:17586
Wagner, L.K., *See* Shera. E.B., 12:17224
Wagoner, H., *See* Kniazewycz, B.G., 12:16011
Wakeman, B.H., *See* Gertz, C.P., 12:15401
Wald, F., Analysis of the invited countries questionnaire responses, 12:15879 (RA;XA)
Presentation of main results of Phase I of the SMPR project initiation study, 12:15877 (RA;XA)
Presentation of the SMPR study, 12:15883 (RA;XA)
Waldo, J.B., Application of the GEM shutdown device to the FFTF reactor, 12:16079 (J;US)
Walker, K.L., Canister grapple for the defense waste processing facility, 12:15482 (J;US)
Walker, L.E., *See* Curran, R.P., 12:15685
Wallace, J.S., *See* Brog, T.K., 12:16337
Wallace, R.G., Correlation between gamma radiation levels and soil radium concentrations at the Edgemont uranium mill site, 12:15549 (RA;US)
See Polehn, J.L., 12:15498
Wallwork, J.C., Microlocalization of brain zinc in zinc-deficient rats, 12:16907 (J;US)
Walsh, J.E., High power, millimeter-wavelength, coherent radiation sources. Final report, 1 February 1982-31 January 1986, 12:16487 (R;US)
See Van Den Dool, H.M., 12:16697
Walsh, J.J., Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast, 12:16786 (J;GB)
Walstrom, P.L., The differential geometry of twisted coil windings, 12:17609 (J;US)
See Sawan, M.E., 12:17575
Walter, J.F., *See* Cybulski, D.S., 12:16119
Walter, T.J., Detection of incipient failure in vertical pumps, 12:15687 (RA;US)
Walters, L.C., *See* Porter, D.L., 12:15850
See Seidel, B.R., 12:15979
Wan, E.I., Methanol production from indigenous resources in New York State. Volume 1. Executive summary, 12:15592 (R;US)
Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants, 12:15593 (R;US)
Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants, 12:15594 (R;US)
Wang, C.S., *See* Berry, G.F., 12:15326
Wang, H.H., *See* Williams, J.M., 12:16416
Wang, J., Environmental impacts of the release of a transuranic actinide, americium-241, from a contaminated facility, 12:15516 (RA;US)
Wang, J.M., Modes of storage ring coherent instabilities, 12:16571 (R;US)
Wang, R., *See* Chamberlain, L.R., 12:16409
Wang, T., *See* Liu, N., 12:16581
Wang, W.C., Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
See Gutowski, W.J. Jr., 12:16759
Wang Liyu, Application of the Miniature Neutron Source Reactor, 12:15989 (RA;XA)
Warburton, E.K., *See* Millener, D.J., 12:17303
Ward, D.A., Sales of nuclear power stations to developing countries: Risk assessment for export credit insurance, 12:15895 (RA;XA)
Ward, K.J., *See* Tallant, D.R., 12:16334
Wardle, L.J., *See* McNabb, K.E., 12:15320
Warlop, R., *See* Mathiot, A., 12:16034
Warnaar, D.B., *See* Anderson, M.S., 12:16444
Warr, B.D., *See* King, P.J., 12:15948
Was, G.S., *See* Paddock, R.A., 12:16237
Washburn, D.K., *See* Kennedy, W.E. Jr., 12:15443
See Stenner, R.D., 12:15557
Washington, W.M., General circulation model CO_2 sensitivity experiments: snow-sea ice albedo parameterizations and globally averaged surface air temperature, 12:16738 (J;NL)
Wasserman, L.C., *See* Bowell, E.L.G., 12:16997
Wasson, O.A., Progress in the detection of low energy neutrons, 12:16626 (RA;CS)
See Behrens, J.W., 12:16669
Watanabe, M., *See* Kasuga, T., 12:16576
Watanabe, Y., Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
See Smith, D.L., 12:17256
Waterman, L.S., *See* Fraser, P.J., 12:16745
See Komhyr, W.D., 12:16762
Watrous, J.J., Ion beam trapping in plasma channels for light ion inertial confinement fusion, 12:17557 (J;US)
Watts, J.A., *See* Olson, J.S., 12:16710
Watts, R.J., *See* Brummert, A.C., 12:15360
Weatherall, J.C., High-frequency broadband emission from turbulent plasmas, 12:17424 (BA;US)
Weaver, W.W., Method to integrate PRA results with plant upgrades, 12:16110 (J;US)

Webb, T. III, Global paleoclimatic data for 6000 yr B.P., 12:16692 (R;US)
Webber, B.R., QCD and hard quark and gluon scattering, 12:17138 (RA;CS)
Weber, A.H., Field evaluation of an emergency response atmospheric dispersion model, 12:16769 (J;US)
Weber, B.J., *See* Young, B.C., 12:15332
Wedeen, R.P., *See* Jones, K.W., 12:16885
Weede, J.J., *See* Listvinsky, G., 12:17507
Weeks, N.L., Mechanical properties of various alloys in hydrogen. Final report, 12:16289 (R;US)
Weggel, C.F., *See* Bogart, S.L., 12:17586
Wehinger, P., *See* Wyckoff, S., 12:17028
Wehinger, P.A., *See* Wyckoff, S., 12:17017
Wehling, *See* Azou, P.Y., 12:16270
Wehowsky, P., *See* Becker, M., 12:15618
Wehring, B.W., Two-source method for determining radiation counting dead time, 12:16662 (J;US)
See Miller, G.D., 12:15581
Wehrle, R.B., *See* Hua, T.Q., 12:17584
See Turner, L.R., 12:17528
Wei, M.W., *See* Musgrove, J.G., 12:15751
Weiler, T.J., Cosmic axion decay to photons in the microwave and infrared regions, 12:17056 (BA;NL)
Theoretical investigations in elementary particle physics: Progress report, June 1, 1986-May 31, 1987, 12:17161 (R;US)
Weisbin, C.R., *See* Goldstein, M., 12:16440
Weisen, H., *See* Hollenstein, Ch., 12:17412
Weisman, J., DNB prediction in assemblies with mixing vanes and unheated tubes, 12:15943 (J;US)
Weiss, R.S., *See* Anspaugh, B.E., 12:15608
Weisshaar, E., *See* Deinzer, W., 12:16947
Welch, G.E., U-tube steam generator model for the DSNP language, 12:15831 (J;US)
Wells, A.H., Effects of high burnup on spent-fuel casks, 12:15910 (J;US)
Wells, G., *See* Menlove, H.O., 12:16647
Wells, K.P., *See* Phelps, R.L. Jr., 12:15821
Wells, S.M., *See* Jones, T.D., 12:16859
Wells, W.F., Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Welty, T., *See* West, L., 12:16161
Wemple, R.P., *See* Dunn, J.C., 12:15630
Wender, I., *See* Blackmond, D.G., 12:15286
Wenkert, D., Visible phase curves of Uranus and Neptune and scattering in their atmospheres, 12:16993 (RA;US)
Wenzel, K.P., *See* Sanderson, T.R., 12:16966
Werley, K.A., *See* Miller, R.L., 12:17503
Werner, M.W., *See* Pendleton, Y., 12:17035
Werner, P., *See* Blank, H., 12:15378
Wessels, P., Development of an universal particle telescope with large dynamics for light and medium heavy fragments, 12:16612 (R;DE;In German)
Wesser, U., Zero power reactor SUR and its application, 12:15986 (RA;XA)
Wesson, J.A., Magnetic reconnection in tokamaks, 12:17402 (RA;CS)
West, L., Californium-252 neutron calibration flux distribution by Monte Carlo simulation, 12:15579 (J;US)
Gamma analysis of soil at SEFOR, a decommissioned reactor, 12:16000 (J;US)
Measurements and status of a decommissioned experimental reactor - SEFOR, 12:16161 (RA;US)
Westbrook, E.M., *See* Strauss, M.G., 12:16600
Westermark, J., *See* Hankins, D.E., 12:16879
Westhoff, J.D., Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
Weston, L.M., *See* Whitehead, D.W., 12:16101
Weulersse, J.M., *See* Gilbert, M., 12:16400
Whalen, M.M., Effects of pH on calcium release from rod outer segment discs, 12:16797 (J;US)
Whangbo, M., Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_2^-, I_3^-), 12:16412 (J;US)
Whatley, K.E., *See* McNees, J.L., 12:15559
Wheeler, T.A., *See* Drouin, M.T., 12:16084
Wheildon, J., Further investigations of the UK heat flow field (1981-1984). Investigation of the geothermal potential of the UK, 12:15628 (R;GB)
Whitaker, T.J., Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
Technology transfer of kinetic phosphorimetry, 12:16392 (RA;US)
See Cannon, B.D., 12:16394
White, A.D., *See* Eng, J., 12:15527
White, C.L., *See* Heldt, L.A., 12:16268
White, C.W., *See* Farlow, G.C., 12:16341
White, D., Remedial action of radium contaminated residential properties, 12:15546 (RA;US)
See Hirst, E., 12:16207
White, E.M., *See* Merlo, C.A., 12:16853, 12:16854
White, J.B., *See* Allen, C.C., 12:16723
White, J.R., *See* Walker, K.L., 12:15482
Whitehead, D.W., Stimulator-based model for estimating operator diagnosis failure probabilities, 12:16101 (J;US)
Whitley, R.H., An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
See Garner, J.K., 12:17512
Whittaker, M.S., *See* Till, J.E., 12:15508
Whittaker, W.L., Design rationale for a remote work vehicle, 12:16128 (J;US)
Whittle, R.R., *See* Sen, A., 12:16413
Wickham, L.E., Cost effectiveness of below-threshold waste disposal at DOE sites, 12:15465 (J;US)
Wicks, G.G., Long-term leaching behavior of simulated Savannah River Plant waste glass: Part 1, MCC-1 leachability results, four-year leaching data, 12:16356 (R;US)
Wien, K., *See* Becker, O., 12:17080
Wigeland, R.A., Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A, 12:16075 (J;US)
Wiggins, P.F., *See* Duffey, D., 12:15941
Wigley, T.M.L., Analytical solution for the effect of increasing CO_2 on global mean temperature, 12:16761 (J;GB)
Surface air temperature anomalies for the Northern Hemisphere, 1881 - present, 12:16690 (R;GB)
Wilcox, A.D., *See* Gross, D.L., 12:15507
Wilgen, J.B., *See* Hillis, D.L., 12:17415
Wilhelm, G., Evaluation of use of the NNC Gamma-12 portal monitor for internal dosimetry screening during decommissioning, 12:16012 (RA;US)
Wilhelm, R.C., *See* Gruetzmacher, K.M., 12:17614
Wilkins, J.D., *See* Chamberlain, H.E., 12:15429
Will, E., Double-arm time-of-flight spectrometer for the DEMAS installation, 12:16629 (R;SU;In Russian)
Williams, A., *See* Seeger, P.A., 12:16648
Williams, F., *See* Qin, X., 12:16411
Williams, F.H. Jr., *See* Jones, K.W., 12:16885
Williams, F.L., Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Williams, F.W., *See* Anderson, M.S., 12:16444
Williams, J.G., Origin of asteroids and small bodies, 12:17016 (RA;US)
Williams, J.M., Ambient-pressure organic superconductor, 12:16416 (P;US)
See Whangbo, M., 12:16412
Williams, L.C., Cleanup operations at the Oak Ridge Gaseous Diffusion Plant contaminated metal scrapyard, 12:15415 (R;US)
Williams, P.A., Industrial safety and health physics interactions during slurry transfer of 1000 curies of radium residues at the Niagara Falls Storage Site (NFSS), 12:15499 (RA;US)
Williams, R.D., Optimization by a computational neural net, 12:17343 (R;US)
Williams, R.E., Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
Williams, R.T., *See* Brewer, P.G., 12:16785
Williams, S., *See* Wicks, G.G., 12:16356
Williamson, K., Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant, 12:15786 (J;US)
Willis, J.O., Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Willis, P.B., *See* Koenig, J.L., 12:15604
Willson, W.G., *See* Sears, R.E., 12:15583
Wilson, B.W., Chemical characterization of materials from a close-coupled catalytic-catalytic two-stage coal liquefaction process, 12:15293 (RA;US)
See Chess, E.K., 12:15330
See Gray, R.H., 12:15340
See Lucke, R.B., 12:15291
See Wright, C.W., 12:15295, 12:15299
Wilson, D.R., *See* Baker, R.B., 12:15854
Wilson, G.G., Applications of economic analysis in gas distribution, 12:15368 (R;US)

Wilson, G.L., Time-dependent nodal integral methods in linear and nonlinear heat conduction, 12:16479 (J;US)
Wilson, G.T., *See* Polehn, J.L., 12:15498
See Wallace, R.G., 12:15549
Wilson, J.W., *See* Burda, T.J., 12:15635
Wilson, K.L., Plasma-material interactions, 12:17630 (BA;US)
Wilson, R.B., *See* McCarty, J.G., 12:15284
Wilson, R.R., *See* Heaphy, R.F., 12:15747
Wilson, W.E., Monte Carlo calculation of energy deposition and ionization yield for high energy protons, 12:17324 (RA;US)
See Hadley, R.T., 12:16872
See Miller, J.H., 12:17315, 12:17321
Winans, R.E., Mild oxidative solubilization of coal macerals, 12:15300 (R;US)
Windheim, R., Wind energy utilization status of research and development in the Federal Republic of Germany, 12:15641 (BA;US)
Wing, N.D., *See* Leeper, R.J., 12:17487
Wintucky, W.T., *See* Bobula, G.A., 12:16228
Wirgau, K.A., *See* Price, W.W., 12:16174
Wiringa, R.B., Variational Monte Carlo calculations of few-body nuclei, 12:17206 (R;US)
Witkover, R.L., Optical analog data link with simple self-test feature, 12:16495 (P;US)
Witschi, H.P., Toxicokinetics of model compounds, 12:16888 (RA;US)
Witt, L.A., Alternative low-level waste processing techniques, 12:15467 (J;US)
Wittenberg, L.J., *See* Larsen, E.M., 12:17581
See Sviatoslavsky, I.N., 12:17511
Wittke, F., *See* Casser, E., 12:16153
Witzig, W.F., *See* Voth, M.H., 12:15462
Wohletz, K.H., *See* Gaffney, E.S., 12:16678
Wohlfahrt, H.D., Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
See Shera. E.B., 12:17224
Wojcicki, S., *See* Hanjalic, K., 12:15296
Wojcik, A.S., *See* Chisholm, G.H., 12:16028, 12:17644
Wojtowicz, M., *See* Suuberg, E.M., 12:15298
Wolery, T.J., *See* Knauss, K.G., 12:16928
Wolf, A.P., *See* Arnett, C.D., 12:16816
Wolf, D., Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
Wolfe, A.K., Confidence in technologies: Interactions between publics and industries, 12:16912 (R;US)
Wolfer, W.G., *See* Glasgow, B.B., 12:17574
Wolff, R.K., Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
See Mauderly, J.L., 12:16893
Wolfson, A., *See* Listvinsky, G., 12:17507
Wollenberg, H.A., *See* Mathews, M.A., 12:15347
Wolsky, A.M., *See* Berry, G.F., 12:15326
Wolson, R.D., The integral fast reactor fuels reprocessing laboratory at Argonne National Laboratory, Illinois, 12:15384 (R;US)
Wolters, H., Experiences made during planning and operation of a big cogeneration unit in a municipal facility, 12:15677 (RA;DE;In German)
Wong, C.P.C., Thin blanket designs for the Elongated Tokamak Commercial Reactor, 12:17515 (J;US)
See Schultz, K.R., 12:17505
Wong, M., *See* Metting, N.F., 12:17320
Wong, P.Z., Spin-waves in the uniaxial spin-glass system Fe/sub 1-x/Mg/sub x/Cl_2, 12:17337 (R;US)
Wong Cheukyin, Scalar magnetic (e/sup +/e/sup -/) resonance as possible source of an anomalous e/sup +/ peak in heavy-ion collisions, 12:17084 (J;NL)
Woo, J.T., *See* Price, R.E., 12:17587
See Saadatmand, K., 12:17421
Wood, D.S., Stress rupture properties of austenitic steel weld metals, 12:16271 (R;FR)
Tensile properties of austenitic steel weld metals, 12:16272 (R;FR)
Wood, J.C., *See* Sills, H.E., 12:16022
Wood, J.W., *See* Walter, T.J., 12:15687
Wood, L.L., Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)
Wood, R.F., Modeling of undercooling, nucleation, and multiple phase front formation in pulsed-laser-melted amorphous silicon, 12:16370 (J;US)
See Lowndes, D.H., 12:16368
Woodruff, G., *See* File, J., 12:17524
Woodruff, W.H., *See* Hopkins, M.D., 12:16410
Woodruff, W.L., *See* Smith, R.S., 12:15982
Woodwell, G.M., Changes in the area of forests in Rondonia, Amazon Basin, measured by satellite imagery, 12:16780 (BA;US)
Worledge, D.H., *See* Crellin, G.L., 12:15919
Worlton, W.J., Japanese supercomputer initiatives: Challenge and response, 12:17675 (BA;US)
Worrall, D.M., Variability studies of 3C 371. Final report, 1 April 1985-30 September 1986, 12:16968 (R;US)
Wozniak, G.J., *See* McMahan, M.A., 12:16650
Wrenn, B.A., Investigations into the mechanisms of interaction between to microbial populations in activated sludge, 12:16837 (RA;US)
Wright, A.E., *See* Holland, J.W., 12:15978
Wright, B.L., Operation of the m = 1 helicity source, 12:17455 (RA;US)
See Knox, S.O., 12:17448
See Platts, D.A., 12:17454
Wright, B.W., *See* Smith, R.D., 12:15294
Wright, C.W., Chemical analysis of coal-derived materials in commercial use, 12:15299 (RA;US)
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
See Dankovic, D.A., 12:15335
Wright, D.P., Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Wright, I.G., Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Wright, R.Q., *See* Reister, D.B., 12:15362
Wrisley, K., *See* Steiner, D., 12:17516
Wuthrich, S., *See* Tsang, F.Y., 12:17526
Wyckoff, H.L., Emergency diesel generator reliability at US nuclear power plants, 12:16124 (J;US)
Wyckoff, S., International Halley Watch: discipline specialists for spectroscopy and spectrophotometry, 12:17028 (RA;US)
Spectroscopy of comets, 12:17017 (RA;US)
Wynveen, R.A., Residual surface contamination limits: problems in interpretation and implementation, 12:15495 (RA;US)
Wysocki, F.J., Measurement of the line tying current pattern in the proto S-1/C tilt stabilizing structure, 12:17446 (RA;US)

X

Xie Jialin, Beijing Electron Positron Collider (BEPC) project, 12:16580 (RA;US)
Xu, C., *See* Zhang, Y., 12:16585
Xu, X., *See* Zhang, Y., 12:16585
Xue, D., *See* Cho, N., 12:16099

Y

Yackle, T.R., *See* Burchill, W.E., 12:15791
Yagawa, N., *See* Yoshie, T., 12:16883
Yakovlev, V.A., *See* Selitskij, Yu.A., 12:17249
Yamada, M., *See* Ellis, R. Jr., 12:17439
See Hart, G.W., 12:17440
See Janos, A., 12:17441
See Meyerhofer, D.D., 12:17442
See Paul, S.F., 12:17443
Yamamoto, K., *See* Som, P., 12:16824
Yamamoto, T., Mathematical model for advanced electrically stimulated fabric filtration, 12:15740 (RA;US)
See Ensor, D.S., 12:15746
Yamazaki, Y., *See* Wohlfahrt, H.D., 12:17222, 12:17223
Yang Xianshu, *See* Luo Anren, 12:15887
Yarbro, O.O., *See* Feldman, M.J., 12:15389
Yashan, D., Inertia friction welding of 1100 aluminum to type 316 stainless steel, 12:16295 (R;US)
Yates, G.S., *See* Riley, J.T., 12:15325
Yato, T., O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)
Yavornik, E.J., *See* Tuszewski, M., 12:17473
Yeh, H.C., Use of the DSNP simulation language in high-seed dynamic simulation of nuclear power plants, 12:15830 (J;US)
See Hoover, M.D., 12:17552
Yeomans, D.K., Cometary dynamics, 12:17018 (RA;US)
Yeung, W.S., *See* Husain, A., 12:15936

See Salim, T., 12:15793
Yew, P.C., Distributing hot-spot addressing in large-scale multiprocessors, 12:17673 (BA;US)
See Tang, P., 12:17665
Ying, S.H., *See* Weisman, J., 12:15943
Yinger, R.J., Wind park electrical testing by Southern California Edison, 12:15645 (BA;US)
Yip, S., *See* Sabochick, M.J., 12:16251
Yokouchi, Y., *See* Domoto, K., 12:15845
Yoon, W.Y., PC-class microcomputer experience in radiation protection and shielding analysis at INEL, 12:16448 (J;US)
York, R.L., *See* Stevens, R.R. Jr., 12:16563
York, T., *See* Amos, N., 12:16657
York, T.M., *See* Dooling, J.C., 12:17422
See Shieh, D.R., 12:17468
Yoshie, T., Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body, 12:16883 (TG;GB)
Yoshizawa, H., *See* Wong, P.Z., 12:17337
Yoshizawa, Yasukazu, Proceedings of the specialist research meeting on measurements of short-lived isotopes, 12:16646 (R;JP;In Japanese)
Youd, J., *See* Wilheim, G., 12:16012
Young, B.C., Single-particle combustion of Beulah lignite char, 12:15332 (BA;US)
Young, C.C., *See* Atwood, W.B., 12:16658
Young, C.E., *See* Gruen, D.M., 12:16396
Young, J., *See* Bertucio, R., 12:16081
Young, L., Development of a polarized deuterium target by spin exchange with optically pumped K, 12:16540 (R;US)
See Thomas, G.E., 12:16538
Young, M.Y., *See* Takeuchi, K., 12:16094
Young, P., *See* Ellis, R. Jr., 12:17439
See Mimura, M., 12:17445
Young, P.E., *See* Hart, G.W., 12:17440
Young, R.W., *See* Jones, T.D., 12:16859
Youngblood, R., *See* Cho, N., 12:16099
See Guey, C.N., 12:16097
Youssef, M., U.S./JAERI calculational benchmarks for nuclear data and codes intercomparison, 12:17589 (J;US)
Youssef, M.Z., Analyses and intercomparison for Phase I Fusion Integral Experiments at the FNS Facility, 12:17509 (J;US)
Yudin, G.L., Collective excitation of a target by high-density electron beam, 12:17308 (R;SU;In Russian)
Yugo, J.J., *See* Flanagan, C.A., 12:17493
Yukalov, V.I., *See* Baldin, A.M., 12:17294
Yunker, W.H., Corrosion of copper-based materials in gamma radiation, 12:16275 (R;US)
Yurkovskij, Ya., *See* Abrosimov, V.N., 12:16632

Z

Zaghloul, R., Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)
Zajicek, O.T., *See* Godfrey, P.J., 12:16783
Zajtsev, M.M., *See* Gubrienko, K.I., 12:16555
Zakharov, A.F., On the particle capture cross section in the Schwarzschild metric, 12:17369 (R;SU;In Russian)
On the types of unbounded orbits in Kerr metric, 12:17365 (R;SU;In Russian)
Zakharov, V.I., *See* Shifman, M.A., 12:17165
Zamrij, V.N., *See* Elizarov, O.I., 12:16639
Zangar, R.C., *See* Mahlum, D.D., 12:15337
See Springer, D.L., 12:15338
Zappala, F., *See* Giaquinto, L., 12:15659
Zastenker, I.B., *See* Balagurov, A.M., 12:16484
Zav'yalov, V.F., *See* Butenko, V.A., 12:16630
Zavarzina, V.P., Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
Quasi-free scattering of pions on nuclei in the region of Δ/sub 33/-resonance, 12:17283 (RA;SU;In Russian)
Zazyan, M.Z., *See* Akopov, N.Z., 12:16609
Zdesenko, Yu.G., Investigation of backgrounds of scintillation and semiconductor detectors in the underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences, 12:16644 (R;SU;In Russian)
Results of underground experiment of neutrinoless double beta-decay of /sup 76/Ge, 12:17226 (R;SU;In Russian)
Zeitzchel, G., Aspects of remote maintenance in an FRG reprocessing plant from the manufacturer's viewpoint, 12:15396 (J;US)
Zelenin, V.E., *See* Gubrienko, K.I., 12:16555
Zeleny, L.M., *See* Galeev, A.A., 12:16949
Zeman, V., Mathematical model for calculating seismic response of type V 213-C reactor, 12:16051 (RA;CS;In Czech)
Zemlo, L., *See* Rondio, J., 12:17221
Zemlyanukhin, V.V., Quenching rates in 7-rod bundle of zirconium alloy at emergency cooling parameters of WWER, 12:16032 (R;SU;In Russian)
Zemto, L., *See* Augustyniak, W., 12:17228
Zeuthen, A.W., Welding nuclear plant components, 12:15950 (J;US)
Zganjar, E.F., The structure of nuclei far from beta stability: Progress report for the period May 15, 1986 to May 14, 1987, 12:17193 (R;US)
Zhang, C.H., *See* Tsang, K.L., 12:16293, 12:17353
Zhang, J.H., *See* Torardi, C.C., 12:16335
Zhang, J.S., Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots, 12:16795 (R;US)
Zhang, Q., *See* Heath, J.R., 12:16424
Zhang, Y., Plan and present status of synchrotron radiation applications at HESYRL, 12:16585 (RA;US)
Zhang Benai, *See* Du Xiangwan, 12:17280
Zhang Tian-Yuan, Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)
Zheleznykh, I.M., *See* Gusev, G.A., 12:17057
Zhidkov, E.P., Approximate calculation of the conditional Winer integral in quantum mechanics problems. Harmonic oscillator, 12:17380 (R;SU;In Russian)
Approximate calculation of the conditional Wiener integral in quantum mechanics problem. Anharmonic oscillator, 12:17381 (R;SU;In Russian)
Zhou Yongmao, MNSR Reactor, 12:15988 (RA;XA)
Zhu, Y.S., Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)
Zhukov, G.P., *See* Elizarov, O.I., 12:16639
Zhuravlev, B.V., *See* Lychagin, A.A., 12:17213
Ziegler, D., Direct measurement of the enthalpy of fusion of diopside, 12:16927 (J;US)
Ziesing, H.-J., *See* Casser, E., 12:16153
Zimmer, C., *See* Karaffa, M., 12:16716
Zimmer, J., Report on the comparison of measurements between two monostatic Doppler-SODAR's manufactured by REMTECH, 12:16686 (R;DE;In German)
Zimmer, R.A., Field evaluation of windscreens as a fugitive dust control measure for materials storage piles, 12:16704 (RA;US)
Zinov'ev, Yu.M., Scalar multiplets in N=2 supergravity, 12:17360 (R;SU;In Russian)
Zirngiebl, E., Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
See Willis, J.O., 12:16285
Zograbyan, G.G., *See* Arutyunyan, V.N., 12:16546
Zolandz, A., *See* Croft, M., 12:16303
Zubal, I.G., *See* Bizais, Y.J., 12:16821
Zubrin, R.M., *See* Miller, R.L., 12:17502
Zucker, M.S., Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)
Measuring the third factorial moment; application to neutron correlation assay, 12:16666 (J;US)
Zuckerman, D.S., A systems performance and cost model for heavy ion fusion, 12:17620 (J;US)
See Harris, D.B., 12:17558
See Waganer, L.M., 12:17621
Zuppiroli, L., *See* Stoto, T., 12:16325
Zuska, J., *See* Sedlackova, J., 12:16850
Zvyagin, V.V., *See* Bel'skij, N.P., 12:16515
Zwickl, R.D., *See* Sanderson, T.R., 12:16966

SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms (DOE/TIC-7000). Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR
Qualifier
Title, (supplementary information), citation number, (R;US)

The notations in the final parentheses indicate the type of document, e.g., R for Report; the country of publication, e.g., US; and the language if other than English, e.g., In German. Tables of document types and country of publication codes appear after the indexes.

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processes applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept (e.g., Pipeline Quality Gas, see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161.

A

A CODES
Manuals
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)

AAEC
Emergency Plans
APTCARE - Lucas Heights. A plan to cope with accidents at the Research Establishment of the Australian Atomic Energy Commission, Lucas Heights, NSW, 12:16037 (R;AU)

ABSORBED DOSES
See RADIATION DOSES

ABSORBERS (SOLAR)
See SOLAR ABSORBERS

ACCELERATION
Solar Flares
Particle acceleration by turbulent plasmas, 12:16946 (RA;CS)

ACCELERATOR FACILITIES
See also STANFORD LINEAR COLLIDER
TARGET CHAMBERS
Shielding
Shielding design at Fermilab: Calculations and measurements, 12:16549 (R;US)

ACCELERATORS
See also ELECTROSTATIC ACCELERATORS
HEAVY ION ACCELERATORS
LINEAR ACCELERATORS
MESON FACTORIES
PARTICLE BEAM FUSION ACCELERATOR
WAKEFIELD ACCELERATORS
Neutron Leakage
Study of neutron leakage through an Fe shield at an accelerator, 12:16517 (J;US)
Shielding
Neutron shields for medium-energy accelerators, 12:16518 (J;US)

ACCIDENTAL INTAKE
See ACCIDENTS

ACCIDENTAL IRRADIATION
See RADIATION ACCIDENTS

ACCIDENTS
See also RADIATION ACCIDENTS
REACTOR ACCIDENTS
Air Pollution
Study including experiments on the diffusion emissions caused by accidents, 12:16711 (R;DE;In German)

ACCRETION DISKS
Particle Production
Neutron and antineutron production in accretion onto compact objects, 12:17042 (R;US)

ACES
See QUARKS

ACETYLENES
See ALKYNES

ACID ELECTROLYTE FUEL CELLS
Commercialization
Catalyst and electrode research for phosphoric acid fuel cells, 12:16195 (BA;US)
Computerized Simulation
Computer-based phosphoric acid fuel cell analytical tools - Descriptions and usages, 12:16194 (BA;US)
Design
Computer-based phosphoric acid fuel cell analytical tools - Descriptions and usages, 12:16194 (BA;US)
Electrodes
Catalyst and electrode research for phosphoric acid fuel cells, 12:16195 (BA;US)
Performance
Catalyst and electrode research for phosphoric acid fuel cells, 12:16195 (BA;US)

ACID RAIN
Chemical Analysis
Chemical composition of precipitation at Long Island, NY, 12:16732 (J;NL)
Chemical Composition
Chemical composition of precipitation at Long Island, NY, 12:16732 (J;NL)
Research Programs
Effect of areal averaging on performance of a long-range acidic deposition, 12:16729 (RA;US)
Water Pollution
Design of a drinking-water-quality monitoring program, 12:16783 (R;US)

ACIDITY
See PH VALUE

ACIDS (ORGANIC)
See ORGANIC ACIDS

ACTIN
Enzymatic Hydrolysis
Carboxyl group reactivity in actin, 12:16794 (R;US)
ACTINIDE COMPLEXES
See also PLUTONIUM COMPLEXES
Quantitative Chemical Analysis
Semi-microdetermination of nitrogen in actinide compounds by Dumas method, 12:16376 (R;IN)
ACTIVATED SLUDGE PROCESS
Biological Models
Design and construction of a reactor system to model the anaerobic/oxic wastewater treatment system, 12:16835 (RA;US)
ACTIVATION ANALYSIS
Calibration Standards
Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)
ACTIVATION DETECTORS
Calibration
Calibration of thermonuclear neutron detectors, 12:17414 (R;SU;In Russian)
ACTIVATION (RADIO)
See RADIOACTIVATION
ACTIVITY COEFFICIENT
See REACTION KINETICS
ADENOCARCINOMAS
See CARCINOMAS
ADENOSINE TRIPHOSPHATASE
See ATP-ASE
ADGEZATOR
See ELECTRON-RING ACCELERATORS
ADONE
Operation
Status of ADONE as synchrotron radiation source, 12:16575 (RA;US)
AEROSOLS
See also SMOKES
Organic Compounds
Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
AFRICA
See also SOUTH AFRICA
Deforestation
Continental and global scale remote sensing of land cover, 12:16779 (BA;US)
AIR
Corrosive Effects
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Mixing
Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Radionuclide Migration
TFTR offsite dose levels from fusion radiation and effluent releases, 12:17553 (J;US)
AIR POLLUTION
See also INDOOR AIR POLLUTION
Atmospheric Chemistry
Hanford 67-series: atmospheric field-diffusion measurements, micrometeorological and tracer data archive, Set 003 documentation report. Interim report, 12:16719 (R;US)
Data Processing
Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)
Economic Impact
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
Environmental Effects
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Environmental Impacts
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
Environmental Transport
Study including experiments on the diffusion emissions caused by accidents, 12:16711 (R;DE;In German)
Field Tests
Hanford 67-series: atmospheric field-diffusion measurements, micrometeorological and tracer data archive, Set 003 documentation report. Interim report, 12:16719 (R;US)
Mathematical Models
Atmospheric-dispersion index for prescribed burning. Forest Service research paper, 12:16728 (R;US)
Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Measuring Methods
Hydroxyl-radical rate-constant intercomparison study. Final report, 12:16718 (R;US)
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Monitoring
Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)
Pollution Sources
Locating and estimating air emissions from sources of ethylene oxide, 12:16724 (R;US)
Remote Sensing
Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)
AIR POLLUTION CONTROL
Use this term for items that involve the removal or management of pollutants after they are formed by a source.
Cost
A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)
Feasibility Studies
A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)
AIR POLLUTION MONITORING
Accuracy
Precision and accuracy assessments for state and local air-monitoring networks, 1984, 12:16720 (R;US)
Optical Spectrometers
Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation, 12:16725 (R;US)
Statistics
Air quality data - 1985 annual statistics including summaries with reference to standards. Annual report, 12:16712 (R;US)
AIR QUALITY
Standards
Air quality data - 1985 annual statistics including summaries with reference to standards. Annual report, 12:16712 (R;US)
Vinyl chloride standards: responses to comments on January 1985 proposed revisions, 12:16771 (R;US)
AIR SAMPLERS
Calibration
Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
AIRBORNE PARTICLES
See PARTICULATES
AIRBORNE PARTICULATES
See PARTICULATES
AIRCRAFT ACCIDENTS
See ACCIDENTS
ALANINES
Chemical Preparation
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
Labelling
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)

ALAP
See RADIATION PROTECTION
ALARM DOSEMETERS
See RADIATION MONITORS
ALBITE
Dissolution
Dependence of albite dissolution kinetics on pH and time at 25°C and 70°C, 12:16928 (J;US)
Solubility
Experimental investigations of the reaction between albite and acid hydrothermal solutions, 12:15629 (R;DE;In German)
ALCATOR DEVICE
Superconducting Magnets
Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
ALDEHYDES
See also FORMALDEHYDE
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
ALDEHYDO ACIDS
See ALDEHYDES
ALGAE
Biological Adaptation
Sheath pigment formation in a blue-green algae lyngbya aestuarii as an adaptation to high light, 12:16832 (RA;US)
Screening
Microalgae culture collection, 1986-1987, 12:15613 (R;US)
Storage
Microalgae culture collection, 1986-1987, 12:15613 (R;US)
ALKALI METAL COMPOUNDS
See also LITHIUM COMPOUNDS
POTASSIUM COMPOUNDS
Removal
Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)
ALKALI METALS
See also CESIUM
LITHIUM
POTASSIUM
RUBIDIUM
SODIUM
Atom-Atom Collisions
Asymmetric scattering in thermal collisions of alkali (/sup 2/P/sub 3/2/)-atoms with rare gas atoms: Na(3/sup 2/P/sub 3/2/) and K(4/sup 2/P/sub 3/2/) with Ne, Ar and Kr, 12:17079 (RA;CS)
ALKALINE FLOODING
See CAUSTIC FLOODING
ALKENES
See also BUTENES
Synthesis
Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas, 12:16405 (R;DE;In German)
ALKINES
See ALKYNES
ALKYNES
Chemical Preparation
Formation of long carbon chain molecules during laser vaporization of graphite, 12:16424 (J;US)
ALLOY-D-9
Fuel Cans
Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
ALLOY-HD-8077
See NICKEL BASE ALLOYS
ALLOY-HT-9
Corrosion Products
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Creep
Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
Fuel Cans
Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
Physical Radiation Effects
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Stresses
Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
ALLOY-MA-754
See NICKEL BASE ALLOYS
ALLOY-MA-956
See IRON BASE ALLOYS
ALLOYS
See also ALUMINIUM ALLOYS
ANTIMONY ALLOYS
BERYLLIUM ALLOYS
CHROMIUM ALLOYS
COPPER ALLOYS
INTERMETALLIC COMPOUNDS
IRON ALLOYS
LITHIUM ALLOYS
MAGNESIUM ALLOYS
MANGANESE ALLOYS
MOLYBDENUM ALLOYS
NICKEL ALLOYS
NIOBIUM ALLOYS
PHOSPHORUS ADDITIONS
REFRACTORY METALS
RHENIUM ALLOYS
SILICON ALLOYS
TITANIUM ALLOYS
TUNGSTEN ALLOYS
VANADIUM ALLOYS
ZINC ALLOYS
ZIRCONIUM ALLOYS
Corrosion
Advanced metal alloys for energy needs, 12:16319 (BA;US)
Corrosion Resistance
The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
Oxidation
Advanced metal alloys for energy needs, 12:16319 (BA;US)
Physical Radiation Effects
Formation of submicron metastable phase structures in alloys with focused electron or proton beams, 12:16261 (R;US)
Production of freely-migrating defects during irradiation, 12:16250 (R;US)
Surface Treatments
Formation of submicron metastable phase structures in alloys with focused electron or proton beams, 12:16261 (R;US)
Temperature Effects
Fuel system and structural alloy considerations for space nuclear reactor systems, 12:15868 (BA;US)
ALLOY-WAZ-16
See NICKEL BASE ALLOYS
ALPHA DETECTION
Nuclear Emulsions
Sandwich nuclear emulsion emitter-detector-emitter systems with regulated sensitivity, 12:16607 (R;SU;In Russian)
Si Semiconductor Detectors
Detection of charged particles in amorphous silicon layers, 12:16655 (J;NL)
ALPHA PARTICLES
Emitted by nuclei.
See also SOLAR ALPHA PARTICLES
Correlations
Multiplicity dependent light particle correlations in $^{40}Ar + ^{197}Au$ reaction at E/A = 60 MeV°, 12:17236 (R;FR)
Distribution Functions
An alpha particle distribution function for mirror loss-cone type instability calculations, 12:17419 (J;US)
Microdosimetry
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
ALPHA REACTIONS
Nuclear Fireball Model
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Nuclear Reaction Yield
Excitation of target residues in the firestreak model, 12:17289 (R;SU)

ALPHA-BEARING WASTES
Calcination
High-temperature incineration of radioactive waste. Exploitation of the FLK-60 slagging incinerator for the treatment of different waste streams contaminated with plutonium, 12:15428 (R;FR)
Gamma Spectroscopy
Test unit for measurement of small masses of alpha wastes, 12:15409 (R;FR;In French)
Inventories
The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
Nondestructive Analysis
Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems, 12:16385 (R;FR)
Radiation Monitoring
Monitoring of Plutonium Contaminated Solid Waste Streams. A technical guide to design and analysis of monitoring systems, 12:16385 (R;FR)
ALTERNATE FUELS
See SYNTHETIC FUELS
ALTERNATORS
Computerized Control Systems
Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
Design
Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
ALUMINATES
Specific compounds, except those of significance to energy research and development, should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Physical Radiation Effects
Irradiation damage in γ-$LiAlO_2$, 12:16326 (R;FR)
Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Study of a breeding material - γ lithium aluminate, 12:17428 (R;FR)
ALUMINIA
See ALUMINIUM OXIDES
ALUMINIUM
Crystal Structure
A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation, 12:16307 (BA;US)
Electrodeposition
Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Friction Welding
Inertia friction welding of 1100 aluminum to type 316 stainless steel, 12:16295 (R;US)
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Oxidation
Spin polarized photoelectron studies of magnetism in solids: Progress report for period June 1, 1986-May 31, 1987, 12:16265 (R;US)
Physical Radiation Effects
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Surface Contamination
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Surface Properties
Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)
Vacancies
A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation, 12:16307 (BA;US)
ALUMINIUM ALLOYS
See also ALUMINIUM BASE ALLOYS
Annealing
Annealing of cold worked hypostoichiometric Ni_3Al alloys using positron lifetime spectroscopy, 12:16240 (R;US)
Ductility
Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
Fracture Properties
Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
Grain Growth
Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy, 12:16304 (J;US)
Microstructure
Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy, 12:16304 (J;US)
Physical Properties
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Physical Radiation Effects
Formation of submicron metastable phase structures in alloys with focused electron or proton beams (Ni-Al), 12:16261 (R;US)
Surface Treatments
Formation of submicron metastable phase structures in alloys with focused electron or proton beams (Ni-Al), 12:16261 (R;US)
Tensile Properties
Effect of aluminum addition on ductility and yield strength of Fe_3Al alloys with 0.5 wt % TiB_2, 12:16258 (R;US)
Valence
Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)
X-Ray Spectra
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
ALUMINIUM BASE ALLOYS
Rolling
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
Texture
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
ALUMINIUM COMPOUNDS
See also ALUMINATES
ALUMINIUM OXIDES
Biological Effects
Studies of aluminum in rat brain, 12:16884 (R;US)
Chemical Properties
Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils, 12:16775 (R;DE;In German)
Environmental Effects
Investigations in the toxic effect of H ions and Al ions on seedlings of spruce (Picea abies, KARST.) and beech (Fagus sylvatica, L.) in a solution culture, 12:16903 (R;DE;In German)
Toxicity
Investigations in the toxic effect of H ions and Al ions on seedlings of spruce (Picea abies, KARST.) and beech (Fagus sylvatica, L.) in a solution culture, 12:16903 (R;DE;In German)
ALUMINIUM OXIDES
See also CORUNDUM

Catalytic Effects
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Dispersion Hardening
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Erosion
Erosion damage in glass and alumina, 12:16330 (R;US)
Fracture Properties
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Physical Radiation Effects
Use of ion channeling axial scans in the study of ion-implanted Al_2O_3, 12:16341 (J;US)
Structural Chemical Analysis
Spin polarized photoelectron studies of magnetism in solids: Progress report for period June 1, 1986-May 31, 1987, 12:16265 (R;US)
Thermodynamic Properties
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)

ALUMINUM
See ALUMINIUM

ALVEOLI (PULMONARY)
See LUNGS

AMBIENT TEMPERATURE
Monthly Variations
Geographical distribution and seasonality of persistence in monthly mean air temperatures over the United States, 12:16697 (J;US)

AMERICIUM
Ion Exchange Chromatography
High-sensitive and quantitative in-line monitoring method for transplutonium elements separation processes, 12:15382 (R;CN;In Chinese)
Radioactive Waste Processing
Americium product solidification and disposal, 12:15441 (R;US)
Solidification
Americium product solidification and disposal, 12:15441 (R;US)

AMERICIUM 241
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)

AMERICIUM 243
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)

AMERICIUM COMPOUNDS
See also AMERICIUM OXIDES
Absorption Spectroscopy
Laser Induced Photoacoustic Spectroscopy for the oxidation specific determination of actinoids in solution, 12:16388 (R;FR;In German)

AMERICIUM OXIDES
Chemical Properties
Chemical behaviour of Np, Pu and Am in various concentrated salt solutions, 12:16429 (R;FR;In German)

AMINES
See also ANILINE
DOPAMINE
NITROSAMINES
RHODAMINES
Chemical Reactions
ESR studies on the radical cation mechanism of the ring opening of cyclopropylamines, 12:16411 (J;US)

AMINO ALCOHOLS
See AMINES

AMINO SUGARS
See AMINES

AMINOBENZENE
See ANILINE

AMINOGLYCIDES
See AMINES

AMMONIA
Chemical Reactions
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)

AMPHETAMINES
Prior to April 1981, this concept was indexed to BENZEDRINE.
Therapeutic Uses
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
Tissue Distribution
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
Uptake
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)

AMPLIFIERS
Control Systems
Log amplifier with pole-zero compensation, 12:16494 (P;US)
Electronic Circuits
Log amplifier with pole-zero compensation, 12:16494 (P;US)

ANALOG RESONANCES
See ISOBARIC ANALOGS

ANALOG STATES
See ISOBARIC ANALOGS

ANALOG SYSTEMS
Performance
Parity simulation for nuclear plant analysis, 12:15928 (J;US)

ANALOG-TO-DIGITAL CONVERTERS
Analog-to-digital converter, 12:16631 (R;SU;In Russian)

ANALYSIS (ACTIVATION)
See ACTIVATION ANALYSIS

ANEMOMETERS
Design
A low cost and easy to reproduce anemometer for basic wind data acquisition, 12:15633 (BA;US)
Operation
A low cost and easy to reproduce anemometer for basic wind data acquisition, 12:15633 (BA;US)

ANHARMONIC OSCILLATORS
Feynman Path Integral
Approximate calculation of the conditional Wiener integral in quantum mechanics problem. Anharmonic oscillator, 12:17381 (R;SU;In Russian)

ANILINE
Biological Accumulation
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Root Absorption
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)

ANIMAL CELLS
Includes human cells.
See also CHO CELLS
Counting Techniques
Determination of bacterial cell volume with the coulter counter (Escherichia coli), 12:16800 (J;US)
Volume
Determination of bacterial cell volume with the coulter counter (Escherichia coli), 12:16800 (J;US)

ANIMAL FEEDS
Radiosterilization
Changes due to radiation or thermal sterilization in vitamin A level, acidity number and peroxide value of various fats in mixes with cereals, 12:16846 (RA;CS;In Czech)
Radiation processing technology for feed mixes and litter for laboratory animals, 12:16847 (RA;CS;In Czech)

ANIONS
See also HYDROGEN IONS 1 MINUS
Ion Sources
Review of progress in the theory of volume production, 12:17083 (R;US)

ANL
Test Facilities
The integral fast reactor fuels reprocessing laboratory at Argonne National Laboratory, Illinois, 12:15384 (R;US)
ANTARCTIC REGIONS
See also ANTARCTICA
Meteorites
Antarctic meteorite newsletter, volume 9, number 1, 12:17029 (R;US)
ANTARCTICA
Climates
Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
ANTHRACITE
Quantitative Chemical Analysis
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
ANTIFERROMAGNETIC MATERIALS
Heisenberg Model
Monte Carlo study of anisotropic Heisenberg chain with spin 1, 12:17347 (R;JP)
Monte Carlo Method
Monte Carlo study of anisotropic Heisenberg chain with spin 1, 12:17347 (R;JP)
One-Dimensional Calculations
The spatial dependence of spin and charge correlations in a one-dimensional, single impurity, Anderson model, 12:17350 (R;US)
Spin Waves
Spin-waves in the uniaxial spin-glass system Fe/sub 1-x/Mg/sub x/Cl_2 (Fe/sub 1-x/Mg/sub x/Cl_2 for x = 0.3, 0.45 and 0.6), 12:17337 (R;US)
ANTILAMBDA PARTICLES
Particle Production
Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)
ANTIMONY
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
ANTIMONY ALLOYS
Electronic Structure
Magnetization density of 5 f electrons in ferromagnetic PuSb, 12:16313 (J;US)
Magnetization
Magnetization density of 5 f electrons in ferromagnetic PuSb, 12:16313 (J;US)
ANTINEUTRINO-NEUTRON INTERACTIONS
Deep Inelastic Scattering
Anti νn and anti νp interactions in neon nucleus: total cross section ratio and quark-parton analysis, 12:17115 (R;SU)
Experimental comparison of EMC effect in the anti νn and anti νp interactions in neon nucleus, 12:17114 (R;SU)
ANTINEUTRINO-PROTON INTERACTIONS
Deep Inelastic Scattering
Anti νn and anti νp interactions in neon nucleus: total cross section ratio and quark-parton analysis, 12:17115 (R;SU)
Experimental comparison of EMC effect in the anti νn and anti νp interactions in neon nucleus, 12:17114 (R;SU)
ANTINUCLEONS
Annihilation
Heavy ion collisions, the quark-gluon plasma and antinucleon annihilation, 12:17125 (R;IN)
APARTMENT BUILDINGS
Ventilation
Ventilation and occupant behavior in two apartment buildings, 12:16203 (R;US)
APPLICATORS (RADIOTHERAPY)
See RADIATION SOURCES
AQUATIC ECOSYSTEMS
Radionuclide Migration
Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
ARGENTINA
Nuclear Power
Financial problems of nuclear programmes. The experience of Argentina, 12:15891 (RA;XA)
ARGON
Ionization
Multiple target ionization by proton impact, 12:17319 (RA;US)
ARGON 38
Secondary Beams
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)
ARGON 39
Secondary Beams
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)
ARGON 40 REACTIONS
Multiplicity
Multiplicity dependent light particle correlations in ^{40}Ar + ^{197}Au reaction at E/A = 60 MeV°, 12:17236 (R;FR)
ARGONNE NATIONAL LABORATORY
See ANL
ARGONNE SUPERCONDUCTING LINAC
See ATLAS SUPERCONDUCTING LINAC
AROMATIC COMPOUNDS
See AROMATICS
AROMATICS
See also ANILINE
BENZENE
PHENOLS
POLYCYCLIC AROMATIC HYDROCARBONS
TETRALIN
Biodegradation
Preliminary investigation of organisms capable of degrading dieldrin and aromatic compounds: techniques for isolation and characterization, 12:16830 (RA;US)
Oxidation
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report] (Ethylbenzene), 12:16420 (R;US)
ARRAY PROCESSORS
Algorithms
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
Computer Architecture
A communication model for optimizing hierarchical multiprocessor systems, 12:17667 (BA;US)
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
Vector processing on the Alliant FX/8 multiprocessor, 12:17663 (BA;US)
Computerized Simulation
A communication model for optimizing hierarchical multiprocessor systems, 12:17667 (BA;US)
Data Transmission
A communication model for optimizing hierarchical multiprocessor systems, 12:17667 (BA;US)
Executive Codes
Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)
I. Codes
Speedup bounds and processor allocation for parallel programs on multiprocessors, 12:17662 (BA;US)
Memory Devices
A compiler-assisted cache coherence solution for multiprocessors, 12:17661 (BA;US)
Parallel Processing
Speedup bounds and processor allocation for parallel programs on multiprocessors, 12:17662 (BA;US)
Translators
A compiler-assisted cache coherence solution for multiprocessors, 12:17661 (BA;US)
Vector Processing
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
Vector processing on the Alliant FX/8 multiprocessor, 12:17663 (BA;US)

ARSENIC
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Geochemistry
Arsenic distributions in porewaters and sediments of Puget Sound, Lake Washington, the Washington coast and Saanich Inlet, B.C., 12:16929 (J;US)
ARTERIES
Positron Computed Tomography
Radiopharmaceutical delivery system for controlled arterial concentration in physiologic modeling with computed tomography, 12:16822 (J;US)
ARTIFICIAL INTELLIGENCE
Representational issues in machine learning, 12:17641 (R;US)
ASBESTOS
Indoor Air Pollution
Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory, 12:16716 (R;US)
ASDEX TOKAMAK
Plasma Diagnostics
Evolution of radiation power profiles in ASDEX H-mode discharges, 12:17407 (R;DE)
Power Losses
Evolution of radiation power profiles in ASDEX H-mode discharges, 12:17407 (R;DE)
ASHES
See also FLY ASH
Agglomeration
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)
The U-GAS process for producing gas from coal, 12:15275 (R;US)
Chemical Composition
Identification of the physical and chemical characteristics of volcanic hazards, 12:16930 (J;US)
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Evaporation
The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)
Vapor Condensation
The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)
Waste Product Utilization
Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)
ASPENS
Photosynthesis
Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)
ASTEROIDS
Chemical Composition
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Physical properties of asteroids, 12:17015 (RA;US)
Cosmic Dust
Planetary optical and infrared imaging, 12:17022 (RA;US)
Cyanides
Planet-crossing asteroids: interrelationships within the solar system, 12:17010 (RA;US)
Infrared Spectra
Asteroid team, 12:17009 (RA;US)
Infrared spectral studies of asteroids, 12:16996 (RA;US)
Physical properties of asteroids, 12:17015 (RA;US)
Planetary spectroscopy, 12:17005 (RA;US)
Interferometry
Speckle interferometry applied to asteroids and other solar system objects, 12:17004 (RA;US)
Maps
Studies of asteroids and comets, 12:16997 (RA;US)
Origin
Origin of asteroids and small bodies, 12:17016 (RA;US)
Physical Properties
Physical properties of asteroids, 12:17015 (RA;US)
Speckle interferometry applied to asteroids and other solar system objects, 12:17004 (RA;US)
Spectra
Observations of comets and asteroids, 12:16994 (RA;US)
Spin
Cometary dynamics, 12:17018 (RA;US)
Surveys
Research in planetary astronomy at Palomar Observatory, 12:16990 (RA;US)
Thermal Radiation
Infrared observations of small solar-system bodies, 12:17001 (RA;US)
Volatility
Cometary dynamics, 12:17018 (RA;US)
ASTROPHYSICS
Magnetohydrodynamics
Astrophysical dynamo, 12:17088 (RA;CS)
Plasma Macroinstabilities
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
ATLANTIC OCEAN
See also SOUTH ATLANTIC BIGHT
Geochemical Surveys
Distributions of dissolved calcium and alkalinity in the Weddell Sea in winter, 12:16932 (J;US)
ATLAS SUPERCONDUCTING LINAC
Argonne Tandem/Linac Accelerator.
Beam Injection
The ATLAS Positive-Ion Injector project, 12:16541 (R;US)
Operation
ATLAS accelerator laboratory report, 12:16508 (R;US)
ATMOSPHERIC CIRCULATION
Computerized Simulation
Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment, 12:16074 (J;US)
P Codes
Field evaluation of an emergency response atmospheric dispersion model, 12:16769 (J;US)
ATMOSPHERIC PRECIPITATIONS
Aerosols
Measuring dry deposition: a re-assessment of the state-of-the-art, 12:16731 (J;NL)
Gases
Measuring dry deposition: a re-assessment of the state-of-the-art, 12:16731 (J;NL)
Measuring Methods
Measuring dry deposition: a re-assessment of the state-of-the-art, 12:16731 (J;NL)
Particles
Measuring dry deposition: a re-assessment of the state-of-the-art, 12:16731 (J;NL)
Tritium
Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)
ATOM COLLISIONS
See also ATOM-ATOM COLLISIONS
ATOM-MOLECULE COLLISIONS
ION-ATOM COLLISIONS
Mathematical Models
Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
ATOM-ATOM COLLISIONS
Differential Cross Sections
Differential cross-sections of fine structure transitions in K (4P) - He, Ar collisions, 12:17063 (R;FR)
Electric Fields
Influence of an external electric field on thermal collisions between circular Rydberg-state atoms and ground-state helium, 12:17061 (R;FR)
ATOMIC BOMBS
See NUCLEAR WEAPONS
ATOMIC ENERGY
See NUCLEAR ENERGY
ATOMIC EXPLOSIONS
See NUCLEAR EXPLOSIONS

ATOMIC MODELS
Computer Codes
Computer codes for treatment of highly excited atomic states, 12:17660 (RA;DD;In German)
Electronic Structure
Computer codes for treatment of highly excited atomic states, 12:17660 (RA;DD;In German)
Excitation
Computer codes for treatment of highly excited atomic states, 12:17660 (RA;DD;In German)
ATOMIC PHYSICS
Use only for indexing articles of very broad coverage, such as annual reviews, text books, etc.
Meetings
Atomic physics 9, 12:17085 (B;SG)
Scientific Personnel
Committee on Atomic and Molecular Sciences: Technical progress report for the period February 1, 1986-January 31, 1987, 12:17069 (R;US)
ATOMIC WEAPONS
See NUCLEAR WEAPONS
ATOM-MOLECULE COLLISIONS
Cross Sections
Quantum-mechanical study of fine-structure transitions in collisions of Rb(5²Psub(j)) with H_2 and D_2, 12:17064 (R;FR)
Inelastic Scattering
Time of flight experiments of the and H/sup +/ scattered from molecules and solid surfaces, 12:17072 (RA;CS)
Photochemistry
Molecular beam studies and quantum chemistry of elementary photochemical processes: electronic to vibrational energy transfer, 12:17078 (RA;CS)
ATOMS
Resonance Ionization Mass Spectroscopy
High efficiency direct detection of ions from resonance ionization of sputtered atoms, 12:16396 (P;US)
ATP-ASE
Code numbers 3.6.1.3 and 3.6.1.8.
Enzyme Activity
Auxin regulation of a proton translocating ATPase in pea root plasma membrane vesicles (Pisum sativum. L.), 12:16808 (J;US)
ATUCHA REACTOR
Lima, Buenos Aires, Argentina
Operation
Experience with Atucha I Nuclear Power Plant, both as regards technology transfer arrangements and operational experience, 12:15873 (RA;XA)
Technology Transfer
Experience with Atucha I Nuclear Power Plant, both as regards technology transfer arrangements and operational experience, 12:15873 (RA;XA)
ATUCHA-1 REACTOR
See ATUCHA REACTOR
ATWS
Anticipated transients without scram.
Computerized Simulation
Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Heat Transfer
Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Correlation for predicting reactor power during a BWR ATWS, 12:16133 (J;US)
Hydraulics
Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Correlation for predicting reactor power during a BWR ATWS, 12:16133 (J;US)
AUGER ELECTRON SPECTROSCOPY
Uses
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)
AUSTENITIC STEELS
Prior to February, 1978 STEELS and AUSTENITE were used to index this concept.
Fracture Properties
Stress rupture properties of austenitic steel weld metals, 12:16271 (R;FR)
Specifications
Comparison of material property specifications of austenitic steels in fast breeder reactor technology, 12:16273 (R;FR)
Tensile Properties
Tensile properties of austenitic steel weld metals, 12:16272 (R;FR)
AUSTRALIA
See also QUEENSLAND
Wind Power
The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)
AUSTRALIAN ATOMIC ENERGY COMMISSION
See AAEC
AUTOMOBILE EFFICIENCY STANDARDS
See AUTOMOBILES
AUTOMOBILES
Exhaust Gases
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
AUTOMOTIVE FUELS
Compressed Gases
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
Liquefied Natural Gas
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
Liquefied Petroleum Gases
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
AUXILIARY WATER SYSTEMS
Decontamination
Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)
AUXINS
Biochemical Reaction Kinetics
Auxin regulation of a proton translocating ATPase in pea root plasma membrane vesicles (Pisum sativum. L.), 12:16808 (J;US)
AXIONS
Particle Decay
Cosmic axion decay to photons in the microwave and infrared regions, 12:17056 (BA;NL)

Particle Identification
Invisible axion detectors, 12:17055 (BA;NL)
Particle Properties
Cosmic axion decay to photons in the microwave and infrared regions, 12:17056 (BA;NL)

B

B MESONS
Particle Decay
Heavy flavors, 12:17155 (R;US)
Weak Particle Decay
CP violation in heavy flavor decays: Predictions and search strategies, 12:17157 (J;NL)
BACTERIA
See also ESCHERICHIA COLI
SPIROCHAETES
Biological Adaptation
Chemotaxis and algal attachment of caulobacter, 12:16829 (RA;US)
Investigations into the mechanisms of interaction between to microbial populations in activated sludge, 12:16837 (RA;US)
Microbial selection in an artificial ecosystem, 12:16838 (RA;US)
Growth
Factors affecting growth inhibition of enteric bacteria by methyl α-D-glucoside, 12:16836 (RA;US)
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)
Virulence
Hypervirulence of Agrobacterium tumefaciens A281 is encoded in a region of pTiBo542 outside of T-DNA, 12:16803 (J;US)
T-DNA and opine synthetic loci in tumors incited by Agrobacterium tumefaciens A281 on soybean and alfalfa plants, 12:16804 (J;US)
BAGHOUSES
Computerized Control Systems
Computer monitoring of pilot plant baghouse performance, 12:15750 (RA;US)
Fabric Filters
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
Maintenance
Operation and maintenance experience at Harrington Station, 12:15749 (RA;US)
Operating Cost
Operation and maintenance experience at Harrington Station, 12:15749 (RA;US)
Operation
Operation and maintenance experience at Harrington Station, 12:15749 (RA;US)
Performance Testing
Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)
BALLISTIC MISSILE DEFENSE
Technology Transfer
Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)
BAMBOO
Production
Biological engineering for sustainable biomass production, 12:15600 (R;US)
BANGLADESH
Nuclear Power Plants
Economic aspects of implementing a SMPR project. A case study for Bangladesh, 12:15889 (RA;XA)
BANKS
See COMMERCIAL BUILDINGS
BARC
Research Programs
Water Chemistry Division Progress Report, April 1983-April 1985, 12:16399 (R;IN)
BARIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Geochemistry
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)
Solubility
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
BARIUM 137
Resonance Ionization Mass Spectroscopy
Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
Yields
Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
BARIUM 138
Resonance Ionization Mass Spectroscopy
Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
Yields
Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
BARIUM CARBONATES
Precipitation
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
BARIUM CHLORIDES
Chemical Reactions
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
BARIUM FLUORIDES
Spectra
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)
BARRIERS
See VENTILATION BARRIERS
BARSTOW SOLAR PILOT PLANT
10-MW solar central receiver pilot plant at Barstow, California.
Control Systems
10 MWe Solar Thermal Central Receiver Pilot Plant control system description, 12:15620 (R;US)
BARYON RESONANCES
Mass Formulae
Mass formula for multibaryon resonances and prediction of a new stable baryon, 12:17146 (R;SU)
Semileptonic Decay
Semileptonic decays of ordinary and charmed Λ/sup +/sub(c) baryons in chiral theory, 12:17145 (R;SU)
BASALT
Blast Effects
Experimental studies of elastic-wave propagation in a columnar-jointed rock mass, 12:16926 (J;US)
Seismic Surveys
Experimental studies of elastic-wave propagation in a columnar-jointed rock mass, 12:16926 (J;US)
BASIC INTERACTIONS
See also WEAK INTERACTIONS
The fifth force, 12:17126 (R;US)
Gravitation
Comment to the reanalysis of the Eoetvoes experiment, 12:17382 (R;HU)

BATTELLE PACIFIC NORTHWEST LABORATORIES
Research Programs
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
Analysis of coal and coal liquid combustion products, 12:15330 (RA;US)
Application of microdosimetry techniques in health physics, 12:17323 (RA;US)
Averaging dose in inhomogeneously irradiated tissue, 12:17332 (RA;US)
Beta measurement evaluation and upgrade, 12:16876 (RA;US)
Beta-particle dosimetry, 12:16863 (RA;US)
Characterization of metabolites and DNA adducts arising from direct coal liquids exposure, 12:15291 (RA;US)
Chemical analysis of coal-derived materials in commercial use, 12:15299 (RA;US)
Chemical characterization of materials from a close-coupled catalytic-catalytic two-stage coal liquefaction process, 12:15293 (RA;US)
Continuous wave double-resonance ionization and laser-enhanced electron impact ionization, 12:16393 (RA;US)
Department of Energy Laboratory Accreditation program for occupational exposure measurements, 12:16877 (RA;US)
Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products, 12:15292 (RA;US)
Dose-rate evidence for two kinds of radiation damage in stationary-phase mammalian cells, 12:16866 (RA;US)
Double differential ionization cross sections, 12:17314 (RA;US)
Effect of areal averaging on performance of a long-range acidic deposition, 12:16729 (RA;US)
Effects of phase on differential ionization cross sections, 12:17321 (RA;US)
Effluent monitoring systems at Department of energy facilities, 12:16777 (RA;US)
Environmental protection support and assistance, 12:15443 (RA;US)
Flow-cytometric analysis of plateau-phase mammalian cell populations, 12:16799 (RA;US)
Hazard waste risk assessment, 12:15444 (RA;US)
Health physics support and assistance to the Department of Energy, 12:16873 (RA;US)
Implementation of microdosimetry codes on mini-computers, 12:16872 (RA;US)
Improving the precision and range of cell survival assays, 12:16865 (RA;US)
Ion yields in liquid water, 12:17322 (RA;US)
Kinetic differences between fed and starved Chinese hamster ovary cells, 12:16815 (RA;US)
Laser analysis of directly injected supercritical fluids, 12:16394 (RA;US)
Linear energy transfer (LET) effects on repair rate, 12:16864 (RA;US)
Measurement of energy deposition near heavy ion tracks, 12:17320 (RA;US)
Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells, 12:16869 (RA;US)
Monte Carlo calculation of energy deposition and ionization yield for high energy protons, 12:17324 (RA;US)
Multiple target ionization by proton impact, 12:17319 (RA;US)
Personnel neutron dosimeter evaluation and upgrade program, 12:16875 (RA;US)
Positive ion irradiation facility, 12:16862 (RA;US)
Stochastic repair-misrepair model, 12:16870 (RA;US)
Structured ion impact: double differential cross sections, 12:17316 (RA;US)
Sublethal damage is not the same as potentially lethal damage, 12:16867 (RA;US)
Supercritical fluid chromatography and mass spectrometry, 12:15294 (RA;US)
Survival of subpopulations of plateau-phase Chinese hamster ovary (CHO) cells selected by size, 12:16868 (RA;US)
Technical guidelines for radiological calibrations, 12:16874 (RA;US)
Technical assistance to Department of Energy/Office of Operational Safety Assurance Program for remedial action, 12:15442 (RA;US)
Technology transfer of kinetic phosphorimetry, 12:16392 (RA;US)
Theoretical single differential cross sections for bare ions, 12:17315 (RA;US)
Theoretical cross sections for ionization structured ions, 12:17317 (RA;US)
Total ion and electron yields, 12:17318 (RA;US)

BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES

BATTERIES (ISOTOPIC)
See RADIOISOTOPE BATTERIES

BCC LATTICES
Diffusion
Atomic-defect mechanisms for diffusion in refractory bcc metals, 12:16248 (R;US)

BEAM OPTICS
T Codes
TOREX program for calculating aberration coefficients of magnetooptical systems, 12:16530 (R;SU;In Russian)

BEAM SEPARATORS
For velocity separation of secondary beams.
Some proposals on mass separation, precision mass spectrometry and acceleration of radioactive nuclides, 12:16561 (R;SU;In Russian)

BEAM TRANSPORT
Electromagnetic Lenses
Application of graphical design method to beam transport system, 12:16521 (R;CN;In Chinese)

BEAM-PLASMA SYSTEMS
Nonlinear Problems
Non-linear stage of beam instability in the absence of electron capture by a wave field, 12:17410 (R;SU;In Russian)

BEARINGS
Failures
Diagnostic monitoring of axial flow fan bearings, 12:15688 (RA;US)

BEAUTY PARTICLES
Particle Production
Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)
Weak Particle Decay
Heavy flavour decays and the structure of weak interactions, 12:17132 (R;DE)

BEAVER VALLEY-1 REACTOR
Shippingport, Pennsylvania, USA
Air Samplers
Radioactive and electron microscope analysis of effluent monitor sample lines, 12:15969 (J;US)
Radioactive Effluents
Radioactive and electron microscope analysis of effluent monitor sample lines, 12:15969 (J;US)

BEAVER VALLEY-2 REACTOR
Shippingport, Pennsylvania, USA
Air Samplers
Radioactive and electron microscope analysis of effluent monitor sample lines, 12:15969 (J;US)
Radioactive Effluents
Radioactive and electron microscope analysis of effluent monitor sample lines, 12:15969 (J;US)

BEECH TREES
Photosynthesis
Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)
Pollution
Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)

BELGIAN REACTOR 2
See BR-2 REACTOR

BENTONITE
Shrinkage
Shrinkage experiments on bentonite samples, 12:15432 (R;CH;In German)
Stability
Long-term stability of bentonite under repository conditions, 12:15433 (R;CH;In German)
Thermodynamics
Some considerations concerning the thermodynamics and kinetics of the reaction between iron and water in bentonite, 12:16406 (R;CH;In German)
BENZANTHRACENE
Mutagen Screening
Genotoxic effects of binary mixtures of polycyclic aromatic hydrocarbons, 12:16899 (RA;US)
BENZENE
Air Pollution Monitoring
Interlaboratory study of benzene stability of tedlar bags. Final report, 12:16714 (R;US)
Solvent Properties
Phase behavior of coal fluids: Data for correlation development: Report for the period August 1, 1986 to October 31, 1986, 12:15301 (R;US)
BENZOPYRENE
Air Pollution Control
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Carcinogen Screening
Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay, 12:16902 (RA;US)
Initiation-promotion studies with complex mixtures, 12:15341 (RA;US)
Toxicokinetics of model compounds, 12:16888 (RA;US)
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)
Carcinogenesis
Analysis of DNA adducts using trace organic analytical techniques, 12:16896 (RA;US)
Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
DNA Adducts
Characterization of metabolites and DNA adducts arising from direct coal liquids exposure, 12:15291 (RA;US)
Environmental Impacts
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Metabolism
Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene (Lepomis macrochirus; Ondatra zibethica; Blarina brevicauda), 12:16892 (RA;US)
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
Mutagen Screening
Genotoxic effects of binary mixtures of polycyclic aromatic hydrocarbons, 12:16899 (RA;US)
Retention
Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
Toxicity
Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene (Lepomis macrochirus; Ondatra zibethica; Blarina brevicauda), 12:16892 (RA;US)
BENZOPYRROLES
See INDOLES
BERKELEY TRIGA REACTOR
See UCBRR REACTOR
BERYLLIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
BERYLLIUM 12
Hypernuclei
SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
BERYLLIUM 9
Nuclear Rsdii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)
BERYLLIUM 9 TARGET
Neutron Reactions
On mechanisms of reaction /sup 9/Be(n,2n), 12:17280 (RA;CS)
BERYLLIUM ALLOYS
Magnetic Properties
Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
Superconductivity
Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
Tensile Properties
Mechanical properties of various alloys in hydrogen. Final report, 12:16289 (R;US)
BERYLLIUM MODERATORS
See BERYLLIUM
BESSEL DIFFERENTIAL EQUATION
See FOKKER-PLANCK EQUATION
BETA BEAMS (ELECTRONS)
See ELECTRON BEAMS
BETA BEAMS (POSITRONS)
See POSITRON BEAMS
BETA DECAY
For neutron and nuclear decay.
Matrix Elements
First forbidden beta decay in light nuclei, 12:17303 (BA;US)
Wave Functions
First forbidden beta decay in light nuclei, 12:17303 (BA;US)
BETA DETECTION
Coincidence Methods
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)
BETA DOSIMETRY
Research Programs
Beta measurement evaluation and upgrade, 12:16876 (RA;US)
BETA PARTICLES
Emitted by nuclei.
Occupational Exposure
Department of Energy Laboratory Accreditation program for occupational exposure measurements, 12:16877 (RA;US)
BETA SOURCES
Calibration
Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards, 12:17331 (R;US)
BETA SPECTROMETERS
Efficiency
On relative detection efficiency of a channel electron multiplier for electrostatic beta spectrometer, 12:16636 (R;SU;In Russian)
Liquid Scintillators
Automated beta spectrometer, 12:16628 (R;CS;In Czech)
Microchannel Electron Multipliers
On relative detection efficiency of a channel electron multiplier for electrostatic beta spectrometer, 12:16636 (R;SU;In Russian)
BHABHA ATOMIC RESEARCH CENTER
See BARC

BICRYSTALS
Grain Boundaries
Lattice imaging study of grain boundaries at normal incidence to the boundary plane, 12:16267 (R;US)
BINARY MIXTURES
Viscosity
Viscosity behavior in supercooled pure liquids and mixtures, 12:16407 (R;US)
BINARY STARS
Particle Interactions
High energy neutrino absorption and its effects on stars in close x-ray binaries, 12:17037 (R;US)
Particle Production
High energy neutrino absorption and its effects on stars in close x-ray binaries, 12:17037 (R;US)
X Radiation
Compact galactic X-ray sources, 12:16950 (RA;CS)
BIODEGRADATION
Kinetics
Degradation of ortho phenol by streptomycetes in continuous cultures, 12:16828 (RA;US)
BIOGAS
See METHANE
BIOLOGICAL HALF-LIFE
Mathematical Models
Long-term loss of radium in 63 subjects first exposed at ages 6 to 46, 12:16855 (R;US)
BIOLOGICAL INDICATORS
Land Pollution
Environmental biomonitoring with feral rodent species (Peromyscus leucopus), 12:16900 (RA;US)
BIOLOGICAL MATERIALS
X-Ray Fluorescence Analysis
Trace element measurements using white synchrotron radiation, 12:16534 (R;US)
BIOLOGICAL REACTORS
See BIOREACTORS
BIOLOGICAL REPAIR
Biological Models
Stochastic repair-misrepair model, 12:16870 (RA;US)
BIOMASS
Gasification
Biomass partial gasification. Final report, 12:15584 (R;DE;In German)
International Agreements
Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement, 12:15610 (R;US)
Production
Biological engineering for sustainable biomass production, 12:15600 (R;US)
Microalgae culture collection, 1986-1987, 12:15613 (R;US)
Research Programs
Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement, 12:15610 (R;US)
Energy from biomass and wastes: 1985 update, 12:15599 (R;US)
Technology Assessment
Energy from biomass and wastes: 1985 update, 12:15599 (R;US)
BIOMASS PLANTATIONS
Feasibility Studies
Land suitability and availability for energy farming: a regional study Phase 2 report. Final report, 12:15609 (R;US)
BIOREACTORS
Prior to March 1983 this concept was indexed to CHEMICAL REACTORS.
Design
Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
Mathematical Models
Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae, 12:15590 (R;DE;In German)
BIOTECHNOLOGY
The application of principles of technology or engineering to the life sciences.
Resource Assessment
Illinois biotechnology resources: An overview, 12:15601 (R;US)
BIPYRIDINES
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
BIRDS
Ecology
Resource utilization by desert quail: time and energy, food and water, 12:16843 (J;US)
Physiology
Resource utilization by desert quail: time and energy, food and water, 12:16843 (J;US)
BISMUTH
Detection
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)
BITTER SPAR
See DOLOMITE
BITUMENS
Refining
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
Solvent Extraction
Identification of organic compounds in the bitumen of Chattanooga oil shale, 12:15374 (J;US)
Structural Chemical Analysis
Identification of organic compounds in the bitumen of Chattanooga oil shale, 12:15374 (J;US)
Viscosity
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
BITUMINOUS COAL
Calorific Value
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Chemical Composition
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Predicting devolatilization at typical coal combustion conditions with the distributed-energy chain model, 12:15334 (BA;US)
Devolatilization
Predicting devolatilization at typical coal combustion conditions with the distributed-energy chain model, 12:15334 (BA;US)
Hydrogenation
Investigation of coal hydrogenation using deuterium as an isotopic tracer, 12:15308 (BA;US)
Quantitative Chemical Analysis
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Structural Chemical Analysis
Predicting devolatilization at typical coal combustion conditions with the distributed-energy chain model, 12:15334 (BA;US)
BL LACERTAE OBJECTS
Emission Spectra
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)
BLACK HOLES
Capture
On the particle capture cross section in the Schwarzschild metric, 12:17369 (R;SU;In Russian)
Cosmological Models
Two states of CYG X-1 and related sources, 12:17038 (R;US)

Particles
On the particle capture cross section in the Schwarzschild metric, 12:17369 (R;SU;In Russian)
BLADES (COMPRESSOR)
See COMPRESSOR BLADES
BLADES (TURBINES)
See TURBINE BLADES
BLANKETS (BREEDING)
See BREEDING BLANKETS
BLAST FURNACES
Fuel Consumption
Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
BLOWERS
Bearings
Diagnostic monitoring of axial flow fan bearings, 12:15688 (RA;US)
Cracks
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
Mechanical Vibrations
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
BLUE-GREEN ALGAE
See CYANOBACTERIA
BNL
Technology Transfer
Brookhaven National Laboratory: Technology transfer report, Fiscal year 1983, 12:16158 (R;US)
BODY CENTERED CUBIC
See BCC LATTICES
BODY WAVES P (SEISMIC)
See SEISMIC P WAVES
BODY WAVES S (SEISMIC)
See SEISMIC S WAVES
BOILERS
Air Pollution Abatement
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
Corrosion Protection
Condenser performance improvements, 12:15717 (RA;US)
Factors affecting boiler water chemistry, 12:15712 (RA;US)
Recommended water chemistry practices for high pressure-drum type boilers, 12:15711 (RA;US)
Feedwater
Babcock & Wilcox Company water chemistry guidelines for once-through steam generators and drum boilers, 12:15710 (RA;US)
Factors affecting boiler water chemistry, 12:15712 (RA;US)
Recommended water chemistry practices for high pressure-drum type boilers, 12:15711 (RA;US)
Fouling
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Hydrogen Embrittlement
Evaluation and use of iron dispersants in the Con Edison System, 12:15723 (RA;US)
Operation
Corrosion product transport in a cycling fossil plant, 12:15735 (RA;US)
BOILING WATER COOLED AND MODERATED REACTO
See BWR TYPE REACTORS
BOLIVIA
Carbon Cycle
Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
BOLTZMANN COLLISION INTEGRAL
See BOLTZMANN EQUATION
BOLTZMANN EQUATION
Intermolecular Forces
New exact inhomogeneous solutions of the Boltzmann equations, 12:17059 (R;FR)
Numerical Solution
Super problems for supercomputers, 12:17681 (BA;US)
Parallel Processing
Super problems for supercomputers, 12:17681 (BA;US)
BOLTZMANN TRANSPORT EQUATION
See BOLTZMANN EQUATION
BOOSTERS (PARTICLE)
See PARTICLE BOOSTERS
BORN-GREEN-YVON EQUATION
See BOLTZMANN EQUATION
BORON
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Spectrographic determination of boron in Mo-B microalloys, 12:16380 (R;IN)
BORON 10 TARGET
Neutron Reactions
Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory, 12:17254 (R;CN;In Chinese)
BORON 11 TARGET
Neutron Reactions
Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory, 12:17254 (R;CN;In Chinese)
BORON CARBIDES
Physical Radiation Effects
Irradiation damage in boron carbide: point defects, clusters and helium bubbles, 12:16325 (R;FR)
BORON COMPOUNDS
See also BORON CARBIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
BOROSILICATE GLASS
Chemical Reactions
The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
Comparative Evaluations
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Leaching
EC static high-temperature leach test. Summary report of an European Community interlaboratory round robin, 12:16358 (R;FR)
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Long-term leaching behavior of simulated Savannah River Plant waste glass: Part 1, MCC-1 leachability results, four-year leaching data, 12:16356 (R;US)
Solubility
Solubility tests on borosilicate glasses for West Valley waste immobilization, 12:15473 (J;US)
BOROSILICATES
See BOROSILICATE GLASS
BOTTOM MESONS
See B MESONS
BOTTOM PARTICLES
See BEAUTY PARTICLES
BOUNDARIES (GRAIN)
See GRAIN BOUNDARIES
BOVINE
See CATTLE
BR-2 REACTOR
Fuel Elements
Preliminary LEU fuel cycle analyses for the Belgian BR2 reactor, 12:15981 (R;US)

BRACKISH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
BRAIN
See also HIPPOCAMPUS
Positron Computed Tomography
Improved delineation of human dopamine receptors using [18F]-N-methylspiroperidol and PET, 12:16816 (J;US)
BRASS-BETA
Embrittlement
Stress corrosion cracking and metal-induced embrittlement: Comparative studies of local chemistries: Progress report for period September 1, 1986-January 15, 1987, 12:16268 (R;US)
Stress Corrosion
Stress corrosion cracking and metal-induced embrittlement: Comparative studies of local chemistries: Progress report for period September 1, 1986-January 15, 1987, 12:16268 (R;US)
BRAZIL
Deforestation
Changes in the area of forests in Rondonia, Amazon Basin, measured by satellite imagery, 12:16780 (BA;US)
BREAKUP REACTIONS
Three-Body Problem
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)
BREASTS
See MAMMARY GLANDS
BREEDER REACTORS
See also FBR TYPE REACTORS
LWBR TYPE REACTORS
Reactor Components
Complete sodium removal from equipment, 12:15860 (J;US)
BREEDING BLANKETS
Composite Materials
Composite beryllium-ceramics breeder pin elements for a gas cooled solid blanket, 12:17426 (R;FR)
Computerized Simulation
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
Construction
Overview of the TFTR Lithium Blanket Module program, 12:17523 (J;US)
Coolants
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Cooling
Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)
Conceptual design of a self-cooled FLIBE blanket, 12:17514 (J;US)
Coordinated Research Programs
Analyses and intercomparison for Phase I Fusion Integral Experiments at the FNS Facility, 12:17509 (J;US)
Summary of recent results from the JAERI/U.S. Fusion Neutronics Phase I Experiments, 12:17508 (J;US)
Cost Estimation
Cost study of the ESPRESSO blanket for a tandem mirror reactor, 12:17599 (J;US)
Deformation
The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
Design
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
A thin LiPb/Be helium cooled blanket for MINIMARS: Neutronics analysis, 12:17596 (J;US)
Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)
Conceptual design of a self-cooled FLIBE blanket, 12:17514 (J;US)
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Liquid momentum removal using rod arrays applied to the HYLIFE ICF reactor, 12:17568 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
Overview of the TFTR Lithium Blanket Module program, 12:17523 (J;US)
Required momentum, heat, and mass transport experiments for liquid metal blankets, 12:17530 (J;US)
Status of fusion reactor blanket design, 12:17510 (J;US)
The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor, 12:17605 (J;US)
Thin blanket design for MINIMARS - A compact tandem mirror fusion reactor, 12:17511 (J;US)
Thin blanket designs for the Elongated Tokamak Commercial Reactor, 12:17515 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Eddy Currents
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Flow Models
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Flowmeters
Techniques for measurement of velocity in liquid-metal MHD flows, 12:17518 (J;US)
Heat Transfer
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Required momentum, heat, and mass transport experiments for liquid metal blankets, 12:17530 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Hydraulics
Steady-state and transient thermal hydraulics of a breeder-in-tube blanket design, 12:17603 (J;US)
Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor, 12:17605 (J;US)
Irradiation
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)
Liquid Metals
Liquid momentum removal using rod arrays applied to the HYLIFE ICF reactor, 12:17568 (J;US)
Magnetohydrodynamics
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Mass Transfer
Required momentum, heat, and mass transport experiments for liquid metal blankets, 12:17530 (J;US)
Materials
Conceptual design of a self-cooled FLIBE blanket, 12:17514 (J;US)
Helium-cooled, FLiBe-breeder, beryllium-multiplier blanket for MINIMARS, 12:17513 (J;US)
Neutronic optimization of a LiAlO/sub 2/ solid breeder blanket, 12:17604 (J;US)
Materials Testing
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Structural materials for fusion reactor blanket systems, 12:17627 (BA;US)
The chemistry of molten Li/sub 2/BeF/sub 4/, 12:17581 (J;US)

Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)
Thin blanket designs for the Elongated Tokamak Commercial Reactor, 12:17515 (J;US)
Mathematical Models
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
MHD Generators
In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Molten Salts
Nuclear performance optimization of the molten-salt fusion breeder, 12:17534 (J;US)
Neutron Dosimetry
Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)
Neutron Reactions
A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries, 12:17540 (J;US)
Neutron Spectra
Analyses and intercomparison for Phase I Fusion Integral Experiments at the FNS Facility, 12:17509 (J;US)
Neutronic optimization of a LiAlO/sub 2/ solid breeder blanket, 12:17604 (J;US)
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
Summary of recent results from the JAERI/U.S. Fusion Neutronics Phase I Experiments, 12:17508 (J;US)
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
Neutron Transport
The LBM program at the EPFL/LOTUS Facility, 12:17524 (J;US)
Performance
An inherently safe tandem mirror fusion blanket concept, 12:17512 (J;US)
Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
Nuclear performance optimization of the molten-salt fusion breeder, 12:17534 (J;US)
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Performance Testing
A thin LiPb/Be helium cooled blanket for MINIMARS: Neutronics analysis, 12:17596 (J;US)
Fission reactor experiments for solid breeder blankets, 12:17531 (J;US)
Overview of the TFTR Lithium Blanket Module program, 12:17523 (J;US)
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Trade-off study of liquid metal self-cooled blankets, 12:17595 (J;US)
Physical Radiation Effects
Study of a breeding material - γ lithium aluminate, 12:17428 (R;FR)
Pressure Drop
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Research Programs
Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
The LBM program at the EPFL/LOTUS Facility, 12:17524 (J;US)
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)
Rods
The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
S Codes
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Safety Engineering
Fusion blanket inherent safety assessment, 12:17547 (J;US)
Swelling
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
Temperature Gradients
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Thermodynamics
Steady-state and transient thermal hydraulics of a breeder-in-tube blanket design, 12:17603 (J;US)
Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor, 12:17605 (J;US)
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)
Thickness
A thin LiPb/Be helium cooled blanket for MINIMARS: Neutronics analysis, 12:17596 (J;US)
Torque
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
BREMSSTRAHLUNG (MAGNETIC)
See SYNCHROTRON RADIATION
BRINES
Geochemistry
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)
BROMIDES
See also IODINE BROMIDES
MOLYBDENUM BROMIDES
Environmental Transport
Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)
BROMINATED ALIPHATIC HYDROCARBONS
Detection
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)
BROMINE COMPOUNDS
See also BROMIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
BROMINE IODIDES
See IODINE BROMIDES
BRONCHOGENIC CARCINOMA
See CARCINOMAS
RESPIRATORY SYSTEM DISEASES
BRONZE
Corrosion
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
Radiation Effects
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
BROOKHAVEN NATIONAL LABORATORY
See BNL
BROWN COAL
See also LIGNITE
Hydrogenation
Characterisation of insoluble residues from the hydrogenation of Victorian brown coals, 12:15307 (R;AU)
BRUNSWICK-1 REACTOR
Southport, North Carolina, USA
Welded Joints
Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant, 12:15786 (J;US)

BRUNSWICK-2 REACTOR
Southport, North Carolina, USA
Welded Joints
Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant, 12:15786 (J;US)
BUCKLING (STRUCTURAL)
See DEFORMATION
BUDAPEST TRAINING REACTOR
Specifications
Some experience with operation and use of a training reactor, 12:15992 (RA;XA)
Uses
Some experience with operation and use of a training reactor, 12:15992 (RA;XA)
BUILDING (CONSTRUCTING)
See CONSTRUCTION
BUILDING MATERIALS
Protective Coatings
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
Ultrasonic Testing
Characterization of flaws using the zeroes of the real and imaginary parts of the ultrasonic scattering amplitude, 12:16485 (J;US)
BUILDINGS (CONTAINMENT)
See CONTAINMENT BUILDINGS
BUNDLES (FUEL ELEMENTS)
See FUEL ELEMENT CLUSTERS
BURNUP
M Codes
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Optimization
Choosing the optimum burnup, 12:15909 (J;US)
BURROS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50s} and a compilation of experimental data, 12:16859 (R;US)
BURSA OF FABRICIUS
See BIRDS
BUTADIENE
Chemical Preparation
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report], 12:16420 (R;US)
BUTANOLS
Viscosity
Viscosity behavior in supercooled pure liquids and mixtures, 12:16407 (R;US)
BUTENES
Oxidation
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report], 12:16420 (R;US)
BUTYL ALCOHOLS
See BUTANOLS
BUTYLENES
See BUTENES
BUTYRIC ALCOHOLS
See BUTANOLS
BWR TYPE REACTORS
See also BRUNSWICK-1 REACTOR
BRUNSWICK-2 REACTOR
GRAND GULF-1 REACTOR
HDR REACTOR
LA SALLE COUNTY-1 REACTOR
LA SALLE COUNTY-2 REACTOR
LACBWR REACTOR
NINE MILE POINT-1 REACTOR
OYSTER CREEK-1 REACTOR
PEACH BOTTOM-2 REACTOR
PEACH BOTTOM-3 REACTOR
RIVER BEND-1 REACTOR
RIVER BEND-2 REACTOR
TARAPUR-1 REACTOR
TARAPUR-2 REACTOR
ATWS
Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Correlation for predicting reactor power during a BWR ATWS, 12:16133 (J;US)
Auxiliary Water Systems
Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)
Capitalized Cost
Concept of prudence and its impact, 12:16180 (J;US)
Construction
Concept of prudence and its impact, 12:16180 (J;US)
Control Rod Drives
BWR control rod drive scram pilot valve monitoring program, 12:15767 (RA;US)
ECCS
Passive steam-driven injector as ECCS for an inherently safe BWR, 12:16078 (J;US)
Electrical Equipment
Identification of test candidates for investigating the survivability of electrical equipment during severe accidents, 12:16120 (J;US)
Failed Element Detection
LWR Fuel failure detection using the grip sipping method, 12:15779 (J;US)
Fuel Cans
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Fuel Elements
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Steady-sate and load-follow characteristics of various BWR fuel designs, 12:15783 (J;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Fuel Management
Application of high-burnup experience to consolidation equipment design, 12:15782 (J;US)
Low incremental control worth reload patterns for BWRs, 12:15761 (R;IN)
Fuel Rods
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Development of a PCMI analysis code for the Fugen MOX fuel rod, 12:15845 (BA;US)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Fuel-Cladding Interactions
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Heat Transfer
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
Hydraulics
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
Loss of Coolant
Assessment of the heat transfer models in the TRACB02 code, 12:16138 (J;US)
BWR/6 DBA analysis with limited ECC, 12:16090 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Modifications and assessment of rewetting correlations for light water reactor system analysis, 12:16134 (J;US)

Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
Materials Handling Equipment
Application of high-burnup experience to consolidation equipment design, 12:15782 (J;US)
Mathematical Models
A reduced-order model of boiling water reactor linear dynamics, 12:15776 (J;US)
Nuclear Fuels
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Pipes
Application of the leak-before-break approach to BWR piping: Final report, 12:16029 (R;US)
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Pressure Suppression
TRACB04 study on suppression pool swelling during containment venting, 12:16092 (J;US)
Pressure Vessels
Flaw density examinations of a clad boiling water reactor pressure vessel segment, 12:15763 (R;US)
Primary Coolant Circuits
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Radioactive Waste Management
Operating a transportable volume reduction and solidification system (TVR-III), 12:15468 (J;US)
Reactor Accidents
Effect of hygroscopicity on aerosol behavior, 12:16103 (J;US)
Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
Experimental determination of the partition coefficient of HOI, 12:16104 (J;US)
Identification of test candidates for investigating the survivability of electrical equipment during severe accidents, 12:16120 (J;US)
QUASAR: a methodology for quantification of uncertainties in severe-accident source terms, 12:16102 (J;US)
Quasar uncertainty study, 12:16004 (R;US)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Channels
Streamlined one-pass modelling, 12:15835 (J;US)
Reactor Components
Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)
Synthesizing seismic fragility of components by use of existing data, 12:16006 (R;US)
Reactor Cooling Systems
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Core Disruption
Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Reactor Cores
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
Countercurrent flow and flooding with abrupt area changes, 12:15793 (J;US)
Dual loop jet pump model for BWR stability analysis, 12:15795 (J;US)
Prediction of transient axial power distribution for calculation of the DNBR limit, 12:15794 (J;US)
Startup range neutron monitor period-based transient monitor, 12:15788 (J;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Fueling
Low incremental control worth reload patterns for BWRs, 12:15761 (R;IN)
Reactor Kinetics
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Reactor Materials
Aging degradation of cast stainless steel, 12:15765 (R;US)
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Reactor Operation
Long-range goal setting in the nuclear utility industry, 12:15787 (J;US)
Reactor Physics
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
Reactor Safety
Analysis of MSIV-ATWS events with the BNL plant analyzer, 12:16091 (J;US)
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Assessment of the heat transfer models in the TRACB02 code, 12:16138 (J;US)
BWR/6 DBA analysis with limited ECC, 12:16090 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Correlation for predicting reactor power during a BWR ATWS, 12:16133 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)
Gravity-driven core cooling system for a BWR, 12:16077 (J;US)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
TRACB04 study on suppression pool swelling during containment venting, 12:16092 (J;US)
Reactor Shutdown
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Summary of safety relief valve position indication systems, 12:16119 (J;US)

Reactor Simulators
LWR system simulation and transient analysis package on the Oregon State cyber-VE, 12:15790 (J;US)
Reactor Stability
Dual loop jet pump model for BWR stability analysis, 12:15795 (J;US)
Reactor Start-Up
Startup range neutron monitor period-based transient monitor, 12:15788 (J;US)
Relief Valves
Summary of safety relief valve position indication systems, 12:16119 (J;US)
Soil-Structure Interactions
SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
Spent Fuel Elements
Finite difference solution procedure for convection-diffusion problems in irregular geometries, 12:16480 (J;US)
Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities, 12:15402 (J;US)
Spent Fuel Storage
Optimization of spent-fuel storage equipment with extended burnup, 12:15781 (J;US)
Steam Generators
Calculation of once-through steam generator performance using RELAP5/MOD2, 12:15833 (J;US)
Systems Analysis
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Transfer Functions
A reduced-order model of boiling water reactor linear dynamics, 12:15776 (J;US)
Turbines
Equipment and procedural modifications to improve the reliability of Terry turbines used in nuclear service, 12:15785 (J;US)

C

C-2260 RESONANCES
See LAMBDA C PLUS
CABLES (ELECTRIC)
See ELECTRIC CABLES
CADMIUM
Activation Analysis
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
Emission Spectroscopy
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Extraction
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
CADMIUM SELENIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
CADMIUM TELLURIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
CALCIUM
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Geochemistry
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)
Membrane Transport
Effects of pH on calcium release from rod outer segment discs, 12:16797 (J;US)
CALCIUM 40
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CALCIUM 40 TARGET
Oxygen 16 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Proton Reactions
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
CALCIUM 42
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CALCIUM 43
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CALCIUM 44
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)

CALCIUM 46
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CALCIUM 48
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Nuclear Radii
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Spectral Shift
Muonic isotope shifts in the stable Ca nuclei, 12:17223 (J;NL)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CALCIUM 48 REACTIONS
Compound-Nucleus Reactions
Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
CALCIUM 48 TARGET
Pion Plus Reactions
Observation of energetic protons in coincidence with pion-induced double charge exchange on /sup 12/C and /sup 48/Ca, 12:17212 (J;NL)
CALCIUM CARBONATES
See also DOLOMITE
Dissolution
Distributions of dissolved calcium and alkalinity in the Weddell Sea in winter, 12:16932 (J;US)
Ecological Concentration
Distributions of dissolved calcium and alkalinity in the Weddell Sea in winter, 12:16932 (J;US)
Precipitation
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
CALCIUM CHLORIDES
Chemical Reactions
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
Chlorination
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts ($CaCl_2$. CaO salt), 12:16282 (R;US)
Recovery
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts ($CaCl_2$. CaO salt), 12:16282 (R;US)
CALCIUM FLUORIDES
Photoionization
UV laser induced photochromic centers in cerium doped calcium fluoride, 12:16351 (R;US)
CALCIUM OXIDES
Chlorination
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts ($CaCl_2$. CaO salt), 12:16282 (R;US)
CALCULATIONS (COMPUTER)
See COMPUTER CALCULATIONS
CALIFORNIA
Fossil-Fuel Power Plants
SCE experience (Southern California Edison), 12:15722 (RA;US)
Wind Power
Integrating wind energy into the electric utility system, 12:15646 (BA;US)
Permitting windfarms in California: Environmental impacts, local regulations, developer responsibility, 12:15643 (BA;US)
Significance of upper air meteorological conditions in Altamont Pass wind resource assessment, 12:15635 (BA;US)
Wind park electrical testing by Southern California Edison, 12:15645 (BA;US)
Wind speed variability in the California Altamont Pass area, 12:15657 (BA;US)
CALIFORNIUM 252
Neutron Sources
Californium-252 neutron calibration flux distribution by Monte Carlo simulation, 12:15579 (J;US)
Production
TURF Californium facility at Oak Ridge National Laboratory, 12:15577 (J;US)
Spontaneous Fission
Differential study of /sup 252/Cf(sf) neutron emission, 12:17245 (RA;CS)
Theoretical study of the /sup 252/Cf(sf) neutron spectrum, 12:17281 (RA;CS)
CALORIMETERS (PARTICLE)
See SHOWER COUNTERS
CALUTRONS
See ELECTROMAGNETIC ISOTOPE SEPARATORS
CAM
See COMPUTER-AIDED MANUFACTURING
CAMAC SYSTEM
Computer Application to Measurement And Control.
High-rate CAMAC aquisition system, 12:16651 (J;NL)
CANADA
Ambient Temperature
Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
Atmospheric Precipitations
Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
Energy Policy
Canadian wind energy R & D, 12:15639 (BA;US)
Nuclear Power
Nuclear investment and fuel cycle costs. Short and long term evolution of uranium costs. Canadian perspective, 12:15406 (RA;XA)
Wind Power
Canadian wind energy R & D, 12:15639 (BA;US)
CANCER
See NEOPLASMS
CANDU TYPE REACTORS
See also POINT LEPREAU-1 REACTOR
Cobalt 60
Cobalt processing - flask positioner location sensing system, 12:15843 (J;US)
Fission Product Release
A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Fuel Elements
A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Heat Transfer
Modeling of drift effects in CANDU reactors, 12:15844 (J;US)
Hydraulics
Modeling of drift effects in CANDU reactors, 12:15844 (J;US)
Loss of Coolant
A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Model for stratified flow in a CANDU reactor header manifold, 12:16137 (J;US)
Neutron Diffusion Equation
BOXER3: a three dimensional integral transport code for PHWR supercell, 12:15837 (R;IN)
Pumps
Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
Reactor Operation
Search for excellence - goal setting, Ontario Hydro Nuclear Generation experience, 12:15840 (J;US)
Reactor Safety
Model for stratified flow in a CANDU reactor header manifold, 12:16137 (J;US)
Remote Handling Equipment
Cobalt processing - flask positioner location sensing system, 12:15843 (J;US)

Turbogenerators
Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
CANINES
See DOGS
CANISTERS
See CONTAINERS
CANONICAL EQUATIONS
See DIFFERENTIAL EQUATIONS
CARBINOL
See METHANOL
CARBOHYDRATES
Metabolism
Mutants of Escherichia coli affected in inducer exclusion, 12:16825 (RA;US)
Uptake
Mutants of Escherichia coli affected in inducer exclusion, 12:16825 (RA;US)
CARBON
See also CARBON BLACK
GRAPHITE
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Energy Spectra
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Gasification
Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K, 12:15297 (J;US)
Losses
Changes in soil carbon storage and associated properties with disturbance and recovery, 12:16778 (BA;US)
Neutron Reactions
Calculation of damage cross section, 12:17305 (R;IN)
Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters, 12:17252 (R;SU;In Russian)
Pion Minus Reactions
Some topological characteristics of π/sup -/meson interactions with nuclei, 12:17199 (R;SU;In Russian)
Quantity Ratio
Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast, 12:16786 (J;GB)
Reflectivity
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Solidification
Analysis of picosecond pulsed laser melted graphite, 12:17352 (R;US)
CARBON 12
Hypernuclei
SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
Isotope Ratio
Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
CARBON 12 REACTIONS
Gamma Radiation
γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem, 12:17211 (R;SU)
Incomplete Fusion Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Inelastic Scattering
Giant resonance excitation by inelastic scattering of medium energy ^{12}C ions, 12:17233 (R;FR)
Nuclear Fireball Model
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Nuclear Reaction Yield
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
CARBON 12 TARGET
Alpha Reactions
Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)
Carbon 12 Reactions
γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem, 12:17211 (R;SU)
Kaon Minus Reactions
SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
Oxygen 16 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Pion Minus Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
Pion Plus Reactions
Observation of energetic protons in coincidence with pion-induced double charge exchange on /sup 12/C and /sup 48/Ca, 12:17212 (J;NL)
Proton Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
CARBON 13
Diagnostic Uses
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)
Isotope Ratio
Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
CARBON BLACK
Heating
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
CARBON COMPOUNDS
See also CARBONIC ACID
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
CARBON CYCLE
Global Aspects
Calibrating ocean models by the constrained inverse method, 12:16784 (BA;US)
Carbon isotope measurements in baseline air, forest canopy air, and plants, 12:16749 (BA;US)
Changes in soil carbon storage and associated properties with disturbance and recovery, 12:16778 (BA;US)
Changing carbon cycle: a global analysis, 12:16737 (B;US)
Changing carbon cycle: a global analysis, 12:16741 (B;US)
Fossil fuel combustion: recent amounts, patterns, and trends in CO_2, 12:16757 (BA;US)
Global atmospheric CO_2 distribution 1968-1983: interpretation of the results of the NOAA/GMCC measurement program, 12:16742 (BA;US)
Major world ecosystem complexes ranked by carbon in live vegetation: a database, 12:16710 (R;US)
Review of the history of atmospheric CO_2 recorded in ice cores, 12:16746 (BA;US)
Mathematical Models
Analysis of the seasonal and geographical patterns of atmospheric CO_2 distributions with a three-dimensional tracer model, 12:16756 (BA;US)
Calibrating ocean models by the constrained inverse method, 12:16784 (BA;US)
One-dimensional and two-dimensional ocean models for predicting the distribution of CO_2 between the ocean and the atmosphere, 12:16751 (BA;US)

Requirements for a satisfactory model of the global carbon cycle and current status of modeling efforts, 12:16754 (BA;US)
Three-dimensional ocean models for predicting the distribution of CO_2 between the ocean and atmosphere, 12:16752 (BA;US)
Use of observations in calibrating and validating carbon cycle models, 12:16755 (BA;US)
Research Programs
Carbon isotope measurements in baseline air, forest canopy air, and plants, 12:16749 (BA;US)
Variations
Ancient carbon cycle changes derived from tree-ring ^{13}C and ^{14}C, 12:16747 (BA;US)
Estimating changes in the carbon content of terrestrial ecosystems, 12:16750 (BA;US)
CARBON DIOXIDE
Adsorption
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Air Pollution Control
A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)
Air Pollution Monitoring
Analysis of the seasonal and geographical patterns of atmospheric CO_2 distributions with a three-dimensional tracer model, 12:16756 (BA;US)
Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
Atmospheric CO_2 record from direct chemical measurements during the 19th century, 12:16745 (BA;US)
Air-Water Interactions
Transient Tracers in the Oceans (TTO) hydrographic data and carbon dioxide systems, 12:16709 (R;US)
Atmospheric Chemistry
Atmospheric CO/sub 2/ variations based on the tree-ring 13/sub C/ record, 12:16766 (BA;US)
Biological Effects
Effect of carbon dioxide on sorghum yield, root growth, and water use, 12:16906 (J;NL)
Effects of atmospheric CO_2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil, 12:16908 (J;US)
Effects of elevated CO_2 on plants. III. Flower, fruit and seed production and abortion (Datura stramonium; Abutilon theophrasti; Phlox drummondii), 12:16910 (J;GB)
Predicting the response of plants to increasing carbon dioxide: a critique of plant growth models, 12:16764 (J;NL)
Chemical Reactions
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
Climate Models
Simulating the atmospheric carbon dioxide distribution with a three-dimensional tracer model, 12:16743 (BA;US)
Crystallization
CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)
Ecological Concentration
Analysis of the seasonal and geographical patterns of atmospheric CO_2 distributions with a three-dimensional tracer model, 12:16756 (BA;US)
Analytical solution for the effect of increasing CO_2 on global mean temperature, 12:16761 (J;GB)
Ancient carbon cycle changes derived from tree-ring ^{13}C and ^{14}C, 12:16747 (BA;US)
Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
Atmospheric CO_2 record from direct chemical measurements during the 19th century, 12:16745 (BA;US)
Atmospheric CO/sub 2/ variations based on the tree-ring 13/sub C/ record, 12:16766 (BA;US)
Calibrating ocean models by the constrained inverse method, 12:16784 (BA;US)
Carbon dioxide increase in the atmosphere and oceans and possible effects on climate, 12:16739 (J;US)
Carbon isotope measurements in baseline air, forest canopy air, and plants, 12:16749 (BA;US)
Carbonate chemistry during WEPOLEX-81, 12:16790 (J;US)
Changing carbon cycle: a global analysis, 12:16737 (B;US)
Changing carbon cycle: a global analysis, 12:16741 (B;US)
Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
Detection of changes in the global troposphere temperature field induced by greenhouse gases, 12:16734 (J;US)
Effect of carbon dioxide on sorghum yield, root growth, and water use, 12:16906 (J;NL)
Estimating changes in the carbon content of terrestrial ecosystems, 12:16750 (BA;US)
Excess carbon dioxide in the Weddell Sea, 12:16788 (J;US)
Fossil fuel combustion: recent amounts, patterns, and trends in CO_2, 12:16757 (BA;US)
General circulation model CO_2 sensitivity experiments: snow-sea ice albedo parameterizations and globally averaged surface air temperature, 12:16738 (J;NL)
Geologic analogs: their value and limitations in carbon dioxide research, 12:16753 (BA;US)
Global atmospheric CO_2 distribution 1968-1983: interpretation of the results of the NOAA/GMCC measurement program, 12:16742 (BA;US)
Global atmospheric CO_2 distribution and variations from 1968-1982 NOAA/GMCC CO_2 flask sample data, 12:16762 (J;US)
IEA/ORAU long-term global energy-CO_2 model, 12:16700 (R;US)
Inhomogeneous distribution of tracers in the abyssal southern ocean, 12:16792 (J;US)
Interpretation of the Northern Hemispheric record of $^{13}C/^{12}C$ trends of atmospheric CO_2 in tree rings, 12:16748 (BA;US)
Measurements of total carbon dioxide and alkalinity in the North Atlantic Ocean in 1981, 12:16785 (BA;US)
Modeling needs for predicting responses to CO_2 enrichment: plants, communities and ecosystems, 12:16763 (J;NL)
One-dimensional and two-dimensional ocean models for predicting the distribution of CO_2 between the ocean and the atmosphere, 12:16751 (BA;US)
Possible changes in future use of fossil fuels to limit environmental effects, 12:16758 (BA;US)
Predicting the response of plants to increasing carbon dioxide: a critique of plant growth models, 12:16764 (J;NL)
Preliminary observations of oxygen and carbon dioxide of the wintertime Bering Sea marginal ice zone, 12:16787 (J;GB)
Presentation of the 20th century atmospheric CO_2 record in Smithsonian spectrographic plates, 12:16744 (BA;US)
Relationship between atmospheric CO_2 variations and a satellite-derived vegetation index, 12:16736 (J;GB)
Requirements for a satisfactory model of the global carbon cycle and current status of modeling efforts, 12:16754 (BA;US)
Review of the history of atmospheric CO_2 recorded in ice cores, 12:16746 (BA;US)
Simulating the atmospheric carbon dioxide distribution with a three-dimensional tracer model, 12:16743 (BA;US)
Temperatures rise in the global greenhouse, 12:16735 (J;GB)
Three-dimensional ocean models for predicting the distribution of CO_2 between the ocean and atmosphere, 12:16752 (BA;US)
Transient Tracers in the Oceans (TTO) hydrographic data and carbon dioxide systems, 12:16709 (R;US)
Emission
Global energy and carbon dioxide, 12:16701 (R;US)
Environmental Effects
Analytical solution for the effect of increasing CO_2 on global mean temperature, 12:16761 (J;GB)
Carbon dioxide increase in the atmosphere and oceans and possible effects on climate, 12:16739 (J;US)
Effects of dynamic heat fluxes on model climate sensitivity: meridional sensible and latent heat fluxes, 12:16759 (J;US)
Radiodensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth, 12:16773 (R;US)

Relationship between atmospheric CO_2 variations and a satellite-derived vegetation index, 12:16736 (J;GB)
Temperatures rise in the global greenhouse, 12:16735 (J;GB)
General Circulation Models
General circulation model CO_2 sensitivity experiments: snow-sea ice albedo parameterizations and globally averaged surface air temperature, 12:16738 (J;NL)
Mass Transfer
Gas exchange measurements in natural systems, 12:16789 (BA;US)
Mathematical Models
IEA/ORAU long-term global energy-CO_2 model, 12:16700 (R;US)
Monitoring
Global atmospheric CO_2 distribution and variations from 1968-1982 NOAA/GMCC CO_2 flask sample data, 12:16762 (J;US)
Measurements of total carbon dioxide and alkalinity in the North Atlantic Ocean in 1981, 12:16785 (BA;US)
Pollution Sources
Fossil fuel combustion: recent amounts, patterns, and trends in CO_2, 12:16757 (BA;US)
Geologic analogs: their value and limitations in carbon dioxide research, 12:16753 (BA;US)
Interpretation of the Northern Hemispheric record of $^{13}C/^{12}C$ trends of atmospheric CO_2 in tree rings, 12:16748 (BA;US)
Possible changes in future use of fossil fuels to limit environmental effects, 12:16758 (BA;US)
Reduction
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Research Programs
Global atmospheric CO_2 distribution 1968-1983: interpretation of the results of the NOAA/GMCC measurement program, 12:16742 (BA;US)
Sinks
Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast, 12:16786 (J;GB)
Solubility
Phase behavior of coal fluids: Data for correlation development: Report for the period August 1, 1986 to October 31, 1986, 12:15301 (R;US)
Spectroscopy
HALOE science investigation. Semiannual progress report, February-July 1986, 12:16705 (R;US)
Uptake
Carbon dioxide exchange and growth of a pine plantation, 12:16809 (J;NL)

CARBON DIOXIDE FIXATION
Mathematical Models
Model of carbon dioxide assimilation in Chlamydomonas reinhardii, 12:16810 (J;DE)

CARBON DIOXIDE INJECTION
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
Field Tests
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)

CARBON DIOXIDE LASERS
Plasma Production
Plasma plume effects in pulsed carbon dioxide laser spot welding, 12:16321 (BA;US)

CARBON FIBERS
Bromination
Effects of graphitization on the environmental stability of brominated pitch-based fibers, 12:16362 (R;US)
Electric Conductivity
Effects of graphitization on the environmental stability of brominated pitch-based fibers, 12:16362 (R;US)
Thermal Conductivity
Thermal conductivity of pristine and brominated P-100 fibers, 12:16360 (R;US)

CARBON ISOTOPES
See also CARBON 12
CARBON 13
Radioecological Concentration
Inhomogeneous distribution of tracers in the abyssal southern ocean, 12:16792 (J;US)

CARBON MONOXIDE
Chemisorption
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Hydrogenation
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
Monitoring
Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Production
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

CARBON STEELS
Corrosion
Effects of gamma radiolysis on waste package components, 12:16263 (R;US)
Radioactive waste isolation in salt: Peer review of the Office of Nuclear Waste Isolation's draft report on a multifactor test design to investigate uniform corrosion of low-carbon steel, 12:16237 (R;US)
Protective Coatings
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)
Quantitative Chemical Analysis
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)
Radiation Effects
Effects of gamma radiolysis on waste package components, 12:16263 (R;US)

CARBONIC ACID
Equilibrium
Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid, 12:16404 (R;DE;In German)
Water Chemistry
Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid, 12:16404 (R;DE;In German)

CARCINOGEN SCREENING
Coordinated Research Programs
Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay, 12:16902 (RA;US)

CARCINOMAS
Images
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)

CARDIOVASCULAR DISEASES
See also HYPERTENSION
Pathogenesis
Effects of complex organic mixtures of coal liquid on cardiovascular function, 12:15338 (RA;US)

CAROTENOIDS
Biosynthesis
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)
CARS SPECTROSCOPY
See RAMAN SPECTROSCOPY
CASCADE SHOWERS
Properties of the EM cascade: A tutorial utilizing high resolution 3D color graphics, 12:17325 (R;US)
CASCADE SOLAR CELLS
Graded Band Gaps
Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986, 12:15614 (R;US)
Research Programs
Research on multi-band-gap solar cells: Annual subcontract report, 1 April 1985-31 March 1986, 12:15614 (R;US)
CATALYSTS
Chemical Preparation
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Chemical Reactions
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
NMR Spectra
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Performance
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
Performance Testing
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Promoters
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Structural Chemical Analysis
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
CATAWBA-1 REACTOR
York County, South Carolina, USA
Fuel Management
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
Spent Fuel Storage
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
CATAWBA-2 REACTOR
York County, South Carolina, USA
Fuel Management
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
Spent Fuel Storage
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
CATTLE
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
CAUSTIC FLOODING
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
CELL CYCLE
Kinetics
Flow-cytometric analysis of plateau-phase mammalian cell populations, 12:16799 (RA;US)
Kinetic differences between fed and starved Chinese hamster ovary cells, 12:16815 (RA;US)
Survival of subpopulations of plateau-phase Chinese hamster ovary (CHO) cells selected by size, 12:16868 (RA;US)
CELL GROWTH (ANIMAL)
See ANIMAL CELLS GROWTH
CELL GROWTH (PLANT)
See GROWTH
CELL KILLING
Radioinduction
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
CELLS (ANIMAL)
See ANIMAL CELLS
CELLS (BACTERIAL)
See BACTERIA
CEMENT INDUSTRY
Kilns
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln, 12:15314 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)
CENTRAL NUCLEAR EN ATUCHA REACTOR
See ATUCHA REACTOR
CENTRAL RECEIVER POWER PLANTS
See TOWER FOCUS POWER PLANTS
CENTRIFUGAL CONTACTORS
See EXTRACTION APPARATUSES
CERAMIC MELTERS
Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)
CERAMICS
Absorption Spectra
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Brittleness
Ceramics for fusion devices, 12:17629 (BA;US)
Chemical Composition
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Corrosion
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
Crystal Doping
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Crystallography
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Emission Spectra
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Fracture Mechanics
Fracture mechanisms in lead zirconate titanate ceramics, 12:16338 (BA;US)
Mixed-mode fracture of ceramics, 12:16336 (BA;US)
Fracture Properties
Mixed-mode fracture of ceramics, 12:16336 (BA;US)
Grain Boundaries
Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
Neutron Fluence
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)

NMR Spectra
Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials, 12:16327 (R;US)
Physical Radiation Effects
Ceramics for fusion devices, 12:17629 (BA;US)
Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Porosity
Development of nuclear magnetic resonance imaging techniques for characterizing green-state ceramic materials, 12:16327 (R;US)
Temperature Effects
Fuel system and structural alloy considerations for space nuclear reactor systems, 12:15868 (BA;US)
Thermodynamic Properties
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)

CEREBRAL CORTEX
Autoradiography
Studies of aluminum in rat brain, 12:16884 (R;US)

CERIUM
Electronic Structure
Effects of d-integral correlation on the mixed-valence properties of cerium systems: the integral-band problem, 12:16314 (J;US)
Emission Spectroscopy
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)

CERIUM ADDITIONS
Photoionization
UV laser induced photochromic centers in cerium doped calcium fluoride, 12:16351 (R;US)

CERIUM ALLOYS
See also CERIUM ADDITIONS
Physical Properties
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Valence
Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)

CERIUM COMPOUNDS
See also CERIUM HYDRIDES
Electronic Structure
Effects of d-integral correlation on the mixed-valence properties of cerium systems: the integral-band problem, 12:16314 (J;US)
F States
What underlies the Anderson Hamiltonian, 12:17357 (R;US)
Hamiltonians
What underlies the Anderson Hamiltonian, 12:17357 (R;US)
Magnetic Properties
Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)
Photoconductivity
Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)
Photoionization
Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)

CERIUM HYDRIDES
Crystal Structure
Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)
Crystal-Phase Transformations
Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)

CESIUM
Solubility
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
X-Ray Fluorescence Analysis
X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria, 12:16374 (R;IN)

CESIUM 113
Proton Emission Decay
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)

CESIUM 134
Computerized Simulation
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
Structural Chemical Analysis
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)

CESIUM 137
Computerized Simulation
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
Structural Chemical Analysis
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)

CESIUM HYDROXIDES
Hygroscopicity
Effect of hygroscopicity on aerosol behavior, 12:16103 (J;US)

CHANNELS (REACTOR)
See REACTOR CHANNELS

CHARGED PARTICLES
In addition to the specific charged particles listed below, see also the list under ELEMENTARY PARTICLES.
See also ALPHA PARTICLES
BETA PARTICLES
DEUTERONS
IONS
Particle Production
Secondary particle multiplicity in the π/sup -/Ne interactions at psub(π)=6.2 Gev/c, 12:17215 (R;SU;In Russian)

CHARGED-PARTICLE ACTIVATION
See ACTIVATION ANALYSIS
CHARGED PARTICLES

CHARGED-PARTICLE TRANSPORT
Numerical solution of transport equations with particle correction, 12:17356 (R;FR;In French)
Fokker-Planck Equation
Approximation of Fokker-Planck equation by a deterministic particle method, 12:17399 (R;FR;In French)

CHARM PARTICLES
See also D MESONS
LAMBDA C PLUS
Weak Particle Decay
Heavy flavour decays and the structure of weak interactions, 12:17132 (R;DE)

CHARPAK CHAMBERS
See MULTIWIRE PROPORTIONAL CHAMBERS

CHARS
Activation Energy
Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Chemical Properties
Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985, 12:15279 (R;US)
Chemical Reaction Kinetics
Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
Combustion Kinetics
Single-particle combustion of Beulah lignite char, 12:15332 (BA;US)

Gasification
Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Mineralogy
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)
Petrography
Characterisation of insoluble residues from the hydrogenation of Victorian brown coals, 12:15307 (R;AU)
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)
Porosity
Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
Sorptive Properties
Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Surface Area
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Yields
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
CHEMICAL ANALYSIS
See also ACTIVATION ANALYSIS
NUCLEAR REACTION ANALYSIS
Meetings
Analysis of materials (metals, ceramics, minerals) using spectroscopic methods, 12:16390 (R;DE)
CHEMICAL EFFLUENTS
Monitoring
Effluent monitoring systems at Department of energy facilities, 12:16777 (RA;US)
CHEMICAL EXPLOSIVES
See also TATB
Detonations
An integral model of plume rise from high explosive detonations, 12:16679 (R;US)
CHEMICAL HEAT PUMPS
Working Fluids
Selection of working fluids for absorption heat pumps, 12:16204 (R;DE;In German)
CHEMICAL REACTORS
Design
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
The U-GAS process for producing gas from coal, 12:15275 (R;US)
Transformations of inorganic coal constituents in combustion systems: Quarterly report No. 1 for the period October-December 1986, 12:15328 (R;US)
Fluidized Beds
Silicon production in a fluidized bed reactor: Final report, 12:15606 (R;US)
Fuel Feeding Systems
Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)
Mixing
Micromixing and multiple steady state transitions in a CSTR, 12:16419 (J;GB)
Modifications
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
Performance
Micromixing and multiple steady state transitions in a CSTR, 12:16419 (J;GB)
CHEMICALS
See PIGMENTS
REAGENTS
CHEMISTRY (WATER)
See WATER CHEMISTRY
CHERENKOV COUNTERS
Cherenkov radiation ring spectrometers with hodoscopic photomultipliers for measurement of particle velocity with momentum up to 300 GeV/c, 12:16613 (R;SU;In Russian)
CHERENKOV DETECTORS
See CHERENKOV COUNTERS
CHERNOBYLSK-1 REACTOR
Power Distribution
Calculation technique and results of nonstationary fields of energy release in RBMK reactors, 12:15962 (R;SU;In Russian)
CHERNOBYLSK-4 REACTOR
Reactor Accidents
Chernobyl accident: An overview of causes and effects, 12:16031 (R;CH;In German)
Environmental radioactivity and radiation exposure in southern Bavaria after the Chernobyl accident, 12:16768 (R;DE;In German)
Nuclear Safety: Technical progress review, January-March 1987, 12:16063 (R;US)
CHINA
Bilateral Agreements
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
Intergovernmental Cooperation
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
Nuclear Power
Economic efficiency of nuclear power in the People's Republic of China, 12:15887 (RA;XA)
Nuclear Power Plants
Background for and experience with Qinshan project in China, 12:15874 (RA;XA)
Slowpoke Type Reactors
Application of the Miniature Neutron Source Reactor, 12:15989 (RA;XA)
Control system for the MNSR (Miniature Neutron Source Reactor), 12:15958 (RA;XA)
MNSR - A satisfactory tool for training and teaching (Miniature Neutron Source Reactor), 12:15990 (RA;XA)
MNSR Reactor (Miniature Neutron Source Reactor), 12:15988 (RA;XA)
Technology Transfer
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
CHINESE HAMSTER
See HAMSTERS
CHINESE HAMSTER OVARY CELLS
See CHO CELLS
CHIRAL SYMMETRY
More on the first order chiral symmetry transition in QCD, 12:17160 (R;US)

CHITIN
Biodegradation
Anaerobic chitin degradation as a carbon and hydrogen source for sulfate reduction and methanogenesis in salt marsh bacteria, 12:16826 (RA;US)
CHLAMYDOMONAS
Biological Pathways
Effect of light and development of photosynthetic cells: Final report, 12:15602 (R;US)
Biological Radiation Effects
Linear energy transfer (LET) effects on repair rate, 12:16864 (RA;US)
Carbon Dioxide Fixation
Model of carbon dioxide assimilation in Chlamydomonas reinhardii, 12:16810 (J;DE)
Irradiation
Positive ion irradiation facility, 12:16862 (RA;US)
Temperature Effects
Linear energy transfer (LET) effects on repair rate, 12:16864 (RA;US)
CHLORIDES
See also BARIUM CHLORIDES
CALCIUM CHLORIDES
MERCURY CHLORIDES
MOLYBDENUM CHLORIDES
Corrosive Effects
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
CHLORINATED AROMATIC HYDROCARBONS
Biodegradation
Letter to the Editor, 12:16909 (J;US)
Toxicity
Letter to the Editor, 12:16909 (J;US)
CHLORINE 37 TARGET
Neutrino Reactions
Solar neutrino experiments, 12:17106 (RA;CS)
CHLORINE 39
Secondary Beams
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)
CHLORINE COMPOUNDS
See also CHLORIDES
OXYCHLORIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
CHLOROPHYLL
Biosynthesis
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)
CHO CELLS
Autoradiography
Kinetic differences between fed and starved Chinese hamster ovary cells, 12:16815 (RA;US)
Biological Radiation Effects
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
Sublethal damage is not the same as potentially lethal damage, 12:16867 (RA;US)
Survival of subpopulations of plateau-phase Chinese hamster ovary (CHO) cells selected by size, 12:16868 (RA;US)
Enzyme Activity
Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells, 12:16869 (RA;US)
Genetic Radiation Effects
Comparative in vitro and in vivo models of cytotoxicity and genotoxicity, 12:16901 (RA;US)
Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells, 12:16869 (RA;US)
Radiation Dose Distributions
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
Radiation Injuries
Dose-rate evidence for two kinds of radiation damage in stationary-phase mammalian cells, 12:16866 (RA;US)
CHROMATOGRAPHY
Data Acquisition Systems
On-line ion chromatography system, 12:16395 (R;US)
CHROMIUM
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Waste Disposal
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
X-Ray Fluorescence Analysis
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)
CHROMIUM 47
Half-Life
Uncertainties in scientific measurements, 12:17216 (R;US)
CHROMIUM 50
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CHROMIUM 50 TARGET
Nickel 58 Reactions
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
CHROMIUM 52
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CHROMIUM 52 TARGET
Neutron Reactions
/sup 52/Cr(n,xnγ)reactions at 14.6 MeV studied by coincident in-beam techniques, 12:17220 (RA;CS)
CHROMIUM 53
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CHROMIUM 53 TARGET
Carbon 12 Reactions
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)
CHROMIUM 54
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
CHROMIUM ALLOYS
See also INCONEL ALLOYS
STAINLESS STEELS
VANSTAR 7

Corrosion Resistance
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Ion Implantation
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Passivation
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)
Physical Radiation Effects
Detection of near-surface ^{53}Cr segregation in irradiated $^{51}V(Cr)$ by RBS [Rutherford Backscattering Spectrometry] (Rutherford backscattering spectrometry; V-15%Cr), 12:16257 (R;US)
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)

CHROMIUM OXIDES
Dispersion Hardening
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Fracture Properties
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)

CHROMIUM-MOLYBDENUM STEELS
See also ALLOY-HT-9
Protective Coatings
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)

CHROMODYNAMICS
See QUANTUM CHROMODYNAMICS

CIRCULAR POINT COLLECTORS
See PARABOLIC DISH COLLECTORS

CITIES
See URBAN AREAS

CLIMATE MODELS
Sensitivity Analysis
Effects of dynamic heat fluxes on model climate sensitivity: meridional sensible and latent heat fluxes, 12:16759 (J;US)

CLIMATES
Biological Indicators
Tree ring chronology indexes and reconstructions of precipitation in Central Iowa, USA, 12:16689 (R;US)
Data Acquisition
Design and use of climatological data banks, with emphasis on the preparation and homogenization of surface monthly records, 12:16772 (J;NL)
Environmental Effects
Radiodensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth, 12:16773 (R;US)
Variations
Analytical solution for the effect of increasing CO_2 on global mean temperature, 12:16761 (J;GB)
Effects of dynamic heat fluxes on model climate sensitivity: meridional sensible and latent heat fluxes, 12:16759 (J;US)
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
Possible changes in future use of fossil fuels to limit environmental effects, 12:16758 (BA;US)

CLUSTERS (FUEL ELEMENTS)
See FUEL ELEMENT CLUSTERS

CLUSTERS (GALAXY)
See GALAXY CLUSTERS

CLUSTERS (SOLID)
See SOLID CLUSTERS

CNA REACTOR
See ATUCHA REACTOR

CNG PROCESS
Equipment
CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)
Research Programs
CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)

CO2 FLOODING
See CARBON DIOXIDE INJECTION

COAL
See also BROWN COAL
SUBBITUMINOUS COAL
Cleaning
Development of a microwave coal cleaning process: Technical progress report for March 1985-May 1985, 12:15283 (R;US)
Cocombustion
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Combustion
Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air, 12:15326 (R;US)
Combustion Products
Transformations of inorganic coal constituents in combustion systems: Quarterly report No. 1 for the period October-December 1986, 12:15328 (R;US)
Cost
Possible short and long term evolution in the cost of PWRs nuclear fuel and coal, 12:15405 (RA;XA)
Deashing
Development of a microwave coal cleaning process: Technical progress report for March 1985-May 1985, 12:15283 (R;US)
Demetallization
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)
Desulfurization
Development of a microwave coal cleaning process: Technical progress report for March 1985-May 1985, 12:15283 (R;US)
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)
Fluidized-Bed Combustion
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Hydrogenation
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Leaching
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)
Maritime Transport
Establishment of data bank on the self-heating of coal. Final report, 12:15325 (R;US)
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
Microstructure
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Mixing
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Nuclear Magnetic Resonance
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Oxidation
Mild oxidative solubilization of coal macerals, 12:15300 (R;US)
Performance Testing
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Petrology
Mild oxidative solubilization of coal macerals, 12:15300 (R;US)
Pneumatic Transport
Advanced research in instrumentation and control technology: Multiphase flow studies, 12:15323 (R;US)
Porosity
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Processing
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)

Pyrolysis
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985, 12:15279 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
Research Programs
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
Sorptive Properties
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Spontaneous Combustion
Establishment of data bank on the self-heating of coal. Final report, 12:15325 (R;US)
Surface Area
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)

COAL FINES
Combustion
Experimental investigation of the formation of nitrogen oxides in combustion of coal dust. 2nd intermediate report covering the period from May 1, 1983 to June 30, 1984, 12:15329 (R;DE;In German)
Combustion Kinetics
A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)
Electric Charges
Water removal characteristics of fine coal particles, 12:15268 (R;DE;In German)
Particle Size
A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)
Pneumatic Transport
Advanced research in instrumentation and control technology: Multiphase flow studies, 12:15323 (R;US)
Water Removal
Water removal characteristics of fine coal particles, 12:15268 (R;DE;In German)

COAL GASIFICATION
See also TEXACO GASIFICATION PROCESS
U-GAS PROCESS
Catalysts
Catalyzed steam gasification of low-rank coals to produce hydrogen, 12:15583 (J;US)
Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K, 12:15297 (J;US)
Chemical Reactors
Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification. Fifth quarterly report, September 28-December 28, 1985, 12:15279 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
Energy Sources
Analysis of a two-stream direct coal-gasification system, 12:15296 (BA;US)
Entrainment
Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)
Fluidized Beds
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)
Hot Gas Cleanup
Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)
Mathematical Models
Entrained flow gasification at elevated pressure: Quarterly technical progress report No. 7 for the period 1 September 1986 to 30 November 1986, 12:15281 (R;US)
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
Research Programs
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)

COAL GASIFICATION PLANTS
Chemical Effluents
Interaction of trace species with the molten carbonate fuel cell: Task report No. 12, 12:16193 (R;US)
Materials Testing
Protective coatings and claddings: Application/evaluation, 12:15272 (R;US)
Measuring Instruments
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
Waste Water
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)

COAL LIQUEFACTION
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
Tracer Techniques
Investigation of coal hydrogenation using deuterium as an isotopic tracer, 12:15308 (BA;US)

COAL LIQUEFACTION PLANTS
Chars
Characterisation of insoluble residues from the hydrogenation of Victorian brown coals, 12:15307 (R;AU)
Materials Testing
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Measuring Instruments
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
Pumps
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Valves
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)

COAL LIQUIDS
Carcinogen Screening
Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results, 12:15340 (RA;US)
Initiation-promotion studies with complex mixtures, 12:15341 (RA;US)
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)
Carcinogenesis
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Chemical Composition
Investigation of extraction of a model mixture similar to coal oil with supercritical gases, 12:15289 (R;DE;In German)
Chemical Properties
Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products, 12:15292 (RA;US)

Chemical Reaction Yield
Investigation of coal hydrogenation using deuterium as an isotopic tracer, 12:15308 (BA;US)
Mass Spectra
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Metabolites
Characterization of metabolites and DNA adducts arising from direct coal liquids exposure, 12:15291 (RA;US)
Mixtures
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Mutagen Screening
Chemical characterization of materials from a close-coupled catalytic-catalytic two-stage coal liquefaction process, 12:15293 (RA;US)
Complex mixtures: comparative chemical and toxicological characterization, 12:15336 (RA;US)
Mutagenesis
Effects of highly aromatic complex chemical mixtures on the mutagenicity of amino-PAH, nitro-PAH and the intercalating agent, ICR191, 12:15343 (RA;US)
NMR Spectra
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Quantitative Chemical Analysis
Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986, 12:15304 (R;US)
Specific Heat
Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986, 12:15304 (R;US)
Structural Chemical Analysis
Structural characterization/correlation of calorimetric properties of coal fluids: Fifth quarterly report, September 1, 1986-December 31, 1986, 12:15304 (R;US)
Supercritical Gas Extraction
Investigation of extraction of a model mixture similar to coal oil with supercritical gases, 12:15289 (R;DE;In German)
Teratogenesis
Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)
Toxicity
Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results, 12:15340 (RA;US)
Complex mixtures: comparative chemical and toxicological characterization, 12:15336 (RA;US)
Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products, 12:15292 (RA;US)
Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)
Effects of complex organic mixtures of coal liquid on cardiovascular function, 12:15338 (RA;US)
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)

COAL PREPARATION
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)

COAL SEAMS
In-Situ Combustion
Experimental and theoretical studies of reverse combustion in porous media, 12:15331 (BA;US)

COAL TAR
Carcinogen Screening
Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results, 12:15340 (RA;US)
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)
Chemical Analysis
Chemical analysis of coal-derived materials in commercial use, 12:15299 (RA;US)
Mass Spectroscopy
Supercritical fluid chromatography and mass spectrometry, 12:15294 (RA;US)
Supercritical Fluid Chromatography
Supercritical fluid chromatography and mass spectrometry, 12:15294 (RA;US)
Toxicity
Chemical analysis of coal-derived materials in commercial use, 12:15299 (RA;US)
Compilation of toxicological, chemical and engineering data on coal conversion process materials: status and summary of results, 12:15340 (RA;US)
Yields
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)

COAL-DERIVED LIQUIDS
See COAL LIQUIDS

COAL-OIL MIXTURES
See COAL FUEL SLURRIES

COATED FUEL PARTICLES
Burnable Poisons
Integral fuel burnable absorber experience in two- and three-loop cores, 12:15956 (J;US)

COATINGS
See also PROTECTIVE COATINGS
Corrosion
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
Materials Testing
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)

COAXIAL CABLES
Data Transmission
Device for digital data transmission by a coaxial cable, 12:16490 (R;SU;In Russian)

COBALT
Catalytic Effects
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Geochemistry
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
NMR Spectra
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)

COBALT 59 TARGET
Lithium 6 Reactions
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)
Neutron Reactions
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
Uncertainties in scientific measurements, 12:17216 (R;US)

COBALT 60
Production
Cobalt processing - flask positioner location sensing system, 12:15843 (J;US)

COCOMBUSTION
Manuals
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)

COFIRING
See COCOMBUSTION
COGENERATION
Prior to November 1980, this concept was indexed to CO-GENERATION.
See COGENERATION
Energy Supplies
Short-distance heat supply - introduction, 12:16216 (RA;DE;In German)
COGENERATION PLANTS
See DUAL-PURPOSE POWER PLANTS
COHERENT ANTI-STOKES RAMAN SPECTROSCOPY
See RAMAN SPECTROSCOPY
COILS (MAGNETIC)
See MAGNET COILS
COINCIDENCE METHODS
Data Processing
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)
COINCIDENCE SPECTROMETRY
Corrections
Accidental-coincidence corrections, 12:16667 (J;US)
Electronic Circuits
Measuring the third factorial moment; application to neutron correlation assay, 12:16666 (J;US)
Mathematical Models
Hybrid Monte Carlo/analytical model of neutron coincidence counting, 12:16665 (J;US)
Performance
Rejection of outliers in thermal neutron coincidence counting, 12:16668 (J;US)
Status of in-plant neutron coincidence counting, 12:16663 (J;US)
COLD PLASMA
Electromagnetic Radiation
High-frequency broadband emission from turbulent plasmas, 12:17424 (BA;US)
COLLISIONAL PLASMA
ECR Heating
Electron cyclotron resonance heating of a high-density plasma, 12:17416 (R;DK)
COLOGNE SPIRITS
See ETHANOL
COLORADO
Mill Tailings
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 2, Appendices, 12:15562 (R;US)
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 1, Text, 12:15561 (R;US)
Oil Shale Deposits
Assay products from Green River oil shale, 12:15373 (R;US)
COLUMBIUM
See NIOBIUM
COLUMNS (MECHANICAL)
See MECHANICAL STRUCTURES
COMBINED GAS AND STEAM CYCLE POWER PLANTS
See COMBINED-CYCLE POWER PLANTS
COMBINED STEAM-POWER GENERATION
See COGENERATION
COMBINED-CYCLE POWER PLANTS
Prior to March, 1976, the descriptors COMBINED CYCLES and FOSSIL-FUEL POWER PLANTS or THERMAL POWER PLANTS were used for indexing this concept.
Demonstration Programs
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Materials
Materials for large land-based gas turbines. Final report, 1984-1986, 12:15737 (R;US)
COMBUSTION
See also COCOMBUSTION
IN-SITU COMBUSTION
Computer Calculations
Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air, 12:15326 (R;US)
Controlled Atmospheres
Computer simulation of pulverized coal combustion in various CO_2/O_2 atmospheres and in air, 12:15326 (R;US)
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
COMBUSTION CHAMBERS
Turbulent Flow
User's manual for a TEACH computer program for the analysis of turbulent, swirling reacting flow in a research combustor, 12:16499 (R;US)
COMBUSTION KINETICS
Mathematical Models
Simulations of turbulent mixing and reacting flows and their applications to turbulence modeling. Semiannual progress report, 12:16433 (R;US)
COMBUSTION PRODUCTS
Mutagen Screening
Analysis of coal and coal liquid combustion products, 12:15330 (RA;US)
Stack Disposal
Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)
COMETS
See also HALLEY COMET
Ammonia
Advanced infrared astronomy, 12:16971 (RA;US)
Planetary submillimeter spectroscopy, 12:16979 (RA;US)
Carbon Dioxide
Advanced infrared astronomy, 12:16971 (RA;US)
Carbon Isotopes
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Outer planet studies, 12:16981 (RA;US)
Spectroscopic observations of the planets, 12:16986 (RA;US)
Carbon Monoxide
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Chemical Composition
Cometary spectroscopy, 12:17007 (RA;US)
Composition of faint comets, 12:17000 (RA;US)
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
High resolution spectral imagery of comets, 12:17013 (RA;US)
Spatially resolved quantitative spectroscopy of comets, 12:17014 (RA;US)
Chemical Properties
Spectroscopy of comets, 12:17017 (RA;US)
Cosmic Dust
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Cosmic Gases
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Data Compilation
Atlas of Comet Halley 1910 II, 12:16999 (RA;US)
Data Transmission Systems
International Halley Watch: discipline specialists for spectroscopy and spectrophotometry, 12:17028 (RA;US)
Emission Spectra
Composition of faint comets, 12:17000 (RA;US)
International Halley Watch: discipline specialists for photometry and polarimetry, 12:17024 (RA;US)
Hydrocyanic Acid
International Halley Watch: discipline specialists for radio science, 12:17025 (RA;US)
Hydrogen
Ground-based observation of Comet Halley, 12:17012 (RA;US)
Hydroxyl Radicals
International Halley Watch: discipline specialists for radio science, 12:17025 (RA;US)
Infrared Spectra
Cometary spectroscopy, 12:17007 (RA;US)

International Halley Watch: discipline specialists for infrared spectroscopy and radiometry, 12:17026 (RA;US)
International Halley Watch: discipline specialists for spectroscopy and spectrophotometry, 12:17028 (RA;US)
Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers, 12:16977 (RA;US)
Planetary spectroscopy, 12:17005 (RA;US)
Magnetic Fields
High-resolution imaging of solar system objects, 12:16975 (RA;US)
Imaging studies of comets, 12:16998 (RA;US)
Magnetoacoustic Waves
Steepened magnetosonic waves in the high β plasma surrounding Comet Giacobini-Zinner, 12:16967 (R;US)
Maps
Studies of asteroids and comets, 12:16997 (RA;US)
Mass
Spatially resolved quantitative spectroscopy of comets, 12:17014 (RA;US)
Mathematical Models
Physical processes in comets, 12:17011 (RA;US)
Microwave Spectra
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Molecular Ions
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Optical Properties
Optical investigation of Comet Halley, 12:17006 (RA;US)
Oxygen
Ground-based observation of Comet Halley, 12:17012 (RA;US)
Physical Properties
Infrared imaging and photometry of Comet Giacobini-Zinner, 12:17002 (RA;US)
Spectroscopy of comets, 12:17017 (RA;US)
Plasma
Imaging studies of comets, 12:16998 (RA;US)
Plasma Jets
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Satellite Atmospheres
Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986, 12:17031 (R;US)
Spectra
Observations of comets and asteroids, 12:16994 (RA;US)
Planetary research at Lowell Observatory, 12:16995 (RA;US)
Planetary astronomy, 12:17003 (RA;US)
Spin
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Surface Properties
International Halley Watch: discipline specialists for near-nucleus studies, 12:17027 (RA;US)
Surveys
Research in planetary astronomy at Palomar Observatory, 12:16990 (RA;US)
Water
Ground-based observation of Comet Halley, 12:17012 (RA;US)
Infrared observations of planets, 12:17008 (RA;US)
Water Vapor
Advanced infrared astronomy, 12:16971 (RA;US)

COMMERCIAL BUILDINGS
Decommissioning
Decontamination and decommissioning of a luminous dial painting facility: radiological characterization, segregation and disposal of building materials, 12:15548 (RA;US)
Decontamination
Decontamination and decommissioning of a luminous dial painting facility: radiological characterization, segregation and disposal of building materials, 12:15548 (RA;US)
Decontamination of an Americium-241 site, 12:15552 (RA;US)

COMMERCIAL SECTOR
Fuel Consumption
Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)

COMMON MARKET
Energy Policy
The EEC Wind Energy R&D Programme, 1985-1988, 12:15658 (BA;US)
Wind Power
The EEC Wind Energy R&D Programme, 1985-1988, 12:15658 (BA;US)

COMPACT IGNITION TOKAMAK
A Tokamak proposed as a next-step after TFTR, i.e., for extensive ignited-core studies.
Activation Analysis
Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Cooling
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17538 (J;US)
Design
Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Configuration development and structural assessment of the FEDC Ignitor concept, 12:17494 (J;US)
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17538 (J;US)
First Wall
First wall and vacuum vessel analysis for Compact Ignition Tokamaks, 12:17507 (J;US)
Magnet Coils
Configuration development and structural assessment of the FEDC Ignitor concept, 12:17494 (J;US)
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17486 (R;US)
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17538 (J;US)
System studies of Compact Ignition Tokamaks, 12:17535 (J;US)
Maintenance
Maintenance features of the Compact Ignition Tokamak fusion reactor, 12:17432 (R;US)
Neutron Spectra
Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Poloidal Field Divertors
PF coil system comparisons for a compact ignition device, 12:17536 (J;US)
Reactor Maintenance
Maintainability features of the Compact Ignition Tokamak, 12:17570 (J;US)
Reviews
Overview of the Compact Ignition Tokamak, 12:17493 (J;US)
Physics guidelines for the Compact Ignition Tokamak, 12:17492 (J;US)
Shields
Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Superconducting Magnets
Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
T Codes
System studies of Compact Ignition Tokamaks, 12:17535 (J;US)
Vacuum Systems
First wall and vacuum vessel analysis for Compact Ignition Tokamaks, 12:17507 (J;US)

COMPACT TORUS
Prior to October 1982, this concept was indexed to THERMONUCLEAR DEVICES or to a particular experiment if known, e.g., REVERSE-FIELD PINCH.
Acceleration
Compact torus compression of microwaves, 12:17462 (RA;US)
Charged-Particle Transport
FRC plasma transport studies with 1-D plus modified Hill's vortex radial profiles, 12:17468 (RA;US)
Magnet Coils
Experimental and numerical study of various methods of programmed formation on TRX-2, 12:17463 (RA;US)
Magnetic Field Configurations
Experimental and numerical study of various methods of programmed formation on TRX-2, 12:17463 (RA;US)

Generalization of the Taylor Principle, 12:17479 (RA;US)
Mode beating model of ac helicity injection, 12:17478 (RA;US)
Performance
Axial dynamics in field-reversed theta-pinches, 12:17471 (RA;US)
FRC formation studies on FRX-C with Z-discharge ionization, 12:17470 (RA;US)
FRX-C/T large source modification, 12:17473 (RA;US)
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Proposed FRX-D experiment, 12:17474 (RA;US)
Recent FRC translation experiments on FRX-C/T, 12:17469 (RA;US)
Plasma Diagnostics
Nd:Glass lasers for Thomson scattering plasma diagnostics on the compact toroid transport experiment, 12:17422 (BA;US)
Wave Propagation
Compact torus compression of microwaves, 12:17462 (RA;US)
COMPLEX MANIFOLDS
Metrics
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17367 (R;SU;In Russian)
SU Groups
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17367 (R;SU;In Russian)
COMPONENT COOLING SYSTEMS
See AUXILIARY WATER SYSTEMS
COMPOSITE MATERIALS
Compatibility
Assessment of ceramic composites for multimegawatt space nuclear power systems, 12:15867 (R;US)
Nondestructive Testing
Damage assessment in composites by acoustic-ultrasonic technique. Final report, September 1985-August 1986, 12:16346 (R;US)
COMPOUND NUCLEI
Decay
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
Evaporation Model
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS
COMPRESSOR BLADES
Failures
Detection of turbomachine blading problems using on and off-line monitoring, 12:15689 (RA;US)
COMPUTER CALCULATIONS
Methods, not results.
D Codes
Research on and applications of non-linear costs functions in the Dutch energy models SELPE and DELPE, 12:16152 (R;NL;DU)
S Codes
Research on and applications of non-linear costs functions in the Dutch energy models SELPE and DELPE, 12:16152 (R;NL;DU)
COMPUTER CODES
Computer codes are indexed by their initial letter and CODES, e.g., A CODES. If the code name begins with a number the code is indexed to NUMBER CODES.
See also A CODES
D CODES
F CODES
G CODES
H CODES
O CODES
P CODES
R CODES
S CODES
B Codes
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
Data-Flow Processing
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Parallel Processing
Parallel structuring of control and resources management systems for parallel programs, 12:17670 (BA;US)
T Codes
User's manual for a TEACH computer program for the analysis of turbulent, swirling reacting flow in a research combustor, 12:16499 (R;US)
COMPUTER GRAPHICS
Equipment
How to set up a successful production graphics facility, 12:17642 (R;US)
Management
How to set up a successful production graphics facility, 12:17642 (R;US)
COMPUTER PROGRAMS
See COMPUTER CODES
COMPUTER-AIDED MANUFACTURING
Graphics NC generation in a prototype machining laboratory: CAM report, 12:16445 (R;US)
COMPUTERIZED CONTROL SYSTEMS
Performance
Computer monitoring of pilot plant baghouse performance, 12:15750 (RA;US)
COMPUTERIZED SIMULATION
E Codes
Feedback simulation of ramped power transients using transfer functions, 12:15931 (J;US)
M Codes
Development and testing of a Monte Carlo code system for analysis of ionization chamber responses, 12:16661 (J;US)
Monte Carlo Method
Application of quasi-random numbers for simulation, 12:17650 (R;SU;In Russian)
Programming
Graduate student use of DSNP at Idaho State University, 12:15933 (J;US)
Input and control management scheme for the DSNP simulation language, 12:15935 (J;US)
PPC - an interactive preprocessor/compiler for the DSNP simulation language, 12:15932 (J;US)
Special simulation programs generated by DSNP for educational uses, 12:15934 (J;US)
Use of the DSNP simulation language in high-seed dynamic simulation of nuclear power plants, 12:15830 (J;US)
Transfer Functions
Feedback simulation of ramped power transients using transfer functions, 12:15931 (J;US)
COMPUTERS
See also MICROPROCESSORS
Data Transmission
Micro-to-Mainframe Communication Standard: Subsystem design analysis report, 12:17658 (R;US)
CONCENTRATOR SOLAR CELLS
Prior to July, 1979 SOLAR CELLS or specific solar cells descriptors and SOLAR CONCENTRATORS were used to index this concept.
Electric Contacts
Silicon solar cells with polysilicon contacts, 12:15612 (R;US)
Research Programs
Progress in photovoltaic concentrator research, 12:15611 (R;US)
CONDENSERS (STEAM)
See STEAM CONDENSERS
CONFERENCES
See MEETINGS
CONSOLIDATED FUEL REPROCESSING PROGRAM
Test Facilities
Consolidated Fuel Reprocessing Program: Progress report for period July 1 to September 30, 1986, 12:15389 (R;US)
CONSTRUCTION
Schedules
Schedule reconciliation tests for management prudency determination, 12:15915 (J;US)
CONSUMER PRODUCTS
Articles of commerce available to the general public. When possible, use descriptors for the specific products.

Mutagen Screening
Chemical analysis of coal-derived materials in commercial use, 12:15299 (RA;US)
CONTACTS (ELECTRIC)
See ELECTRIC CONTACTS
CONTAINERS
See also PRESSURE VESSELS
Cracks
Radionuclide transport through penetrations in nuclear waste containers, 12:15474 (J;US)
Environmental Impacts
Reference waste package environment report (NNWSI project), 12:15451 (R;US)
Materials Testing
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
Mechanical Vibrations
Effects of liquid on partially filled tanks - numerical results, 12:16050 (RA;CS;In Czech)
Finite element calculation of dynamic behaviour of filled tanks, 12:16048 (RA;CS;In Czech)
Problems of vibration of liquid in axially symmetric tanks, 12:16046 (RA;CS;In Czech)
Vibration of liquid in partially filled horizontal channel, 12:16049 (RA;CS;In Czech)
Seismic Effects
Earthquake resistance of liquid-filled thin-walled cylindrical tanks, 12:16047 (RA;CS;In Czech)
Shock Absorbers
Survey of existing literature in the field of shock-absorbing materials with a view to subsequent adaptation of plastic deformation codes. Phase 1, 12:16442 (R;FR)
CONTAINMENT BUILDINGS
Decontamination
Robotics development at TMI-2, 12:16129 (J;US)
Surface Contamination
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Walls
Operational experiences with a remote core-boring device, 12:16130 (J;US)
CONTAINMENT SPRAY SYSTEMS
Combustion Kinetics
Containment loads due to hydrogen combustion, 12:16144 (BA;CA)
Dynamic Loads
Containment loads due to hydrogen combustion, 12:16144 (BA;CA)
CONTAINMENT SYSTEMS
See also CONTAINMENT SPRAY SYSTEMS
Leaks
Summary of PWR leak detection studies, 12:16093 (J;US)
CONTENT ANALYSIS
See CHEMICAL ANALYSIS
CONTINENTAL SHELF
Natural Gas Deposits
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Petroleum Deposits
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
CONTRACTION
Flow Models
Numerical studies of unreactive contractile networks, 12:16802 (J;US)
CONTROL (INSPECTION)
See INSPECTION
CONTROL ROD DRIVES
Valves
BWR control rod drive scram pilot valve monitoring program, 12:15767 (RA;US)
CONTROL THEORY (REACTOR)
See REACTOR KINETICS
CONVECTION
Magnetic Fields
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
CONVERTERS (ANALOG-DIGITAL)
See ANALOG-TO-DIGITAL CONVERTERS
COOKING
See FOOD PROCESSING
COOLERS
See HEAT EXCHANGERS
COOLING PONDS
Decommissioning
Health physics experience during a uranium and thorium pond closure, 12:15500 (RA;US)
COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS
COOLING TOWERS
Evaporative Cooling
Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers, 12:16477 (R;DE;In German)
COOLING WATER CHEMICAL TREATMENT
See WATER CHEMISTRY
COPEPODS
Diet
Feeding relationships of harpacticoid copepods and microbial flora in a salt marsh, 12:16827 (RA;US)
COPPER
Charged-Particle Transport
High intensity positron beam and angular correlation experiments at Livermore, 12:16312 (BA;US)
Corrosion
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
Diffusion
Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
Electronic Structure
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Extraction
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
Photoemission
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Physical Radiation Effects
High intensity positron beam and angular correlation experiments at Livermore, 12:16312 (BA;US)
Thermal annealing of vacancy and interstitial loops in ion irradiated copper, 12:16305 (J;US)
Radiation Effects
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Surface Coating
Magnetic properties of novel epitaxial films, 12:16254 (R;US)
Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Vacancies
Calculation of the properties of vacancy clusters in copper using a new, efficient energy minimization scheme, 12:16251 (R;US)
X-Ray Fluorescence Analysis
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)

X-Ray Spectra
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
COPPER 63 TARGET
Alpha Reactions
Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)
COPPER 67
Radioimmunoassay
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
Therapeutic Uses
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
COPPER ALLOYS
See also COPPER BASE ALLOYS
Physical Properties
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
Valence
Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)
COPPER BASE ALLOYS
See also BRONZE
Corrosion
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
Radiation Effects
Corrosion of copper-based materials in gamma radiation (NNWSI project), 12:16275 (R;US)
COPPER COMPOUNDS
See also COPPER SELENIDES
Magnetic Properties
Induced magnetic form factor of $CeCu_6$, 12:17339 (R;US)
COPPER SELENIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
COPPER VAPOR LASERS
See GAS LASERS
CORES (DRILL)
See DRILL CORES
CORES (REACTOR)
See REACTOR CORES
CORIOLIS FORCE
Convection
Convection-driven dynamos, 12:16943 (RA;CS)
CORONA (SOLAR)
See SOLAR CORONA
CORROSION INHIBITORS
Coordinated Research Programs
Evaluation and use of iron dispersants in the Con Edison System, 12:15723 (RA;US)
CORROSION PRODUCTS
Mass Transfer
Corrosion product transport in a cycling fossil plant, 12:15735 (RA;US)
Transport of chemicals in steam cycles, 12:15718 (RA;US)
Removal
Transport of chemicals in steam cycles, 12:15718 (RA;US)
CORTEX (CEREBRAL)
See CEREBRAL CORTEX
CORUNDUM
See also RUBY
Electron Collisions
Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons, 12:17344 (R;SU;In Russian)
F Centers
Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons, 12:17344 (R;SU;In Russian)
COSMETICS
See CONSUMER PRODUCTS
COSMIC DUST
Absorption Spectra
Infrared observations of planets, 12:17008 (RA;US)
Origin
Interplanetary and interstellar dust, 12:17023 (RA;US)
Water
Infrared observations of planets, 12:17008 (RA;US)
COSMIC GAMMA RAYS
See COSMIC PHOTONS
COSMIC GAMMA SOURCES
Gamma Spectrometers
Gamma-ray spectrometer experiment on the solar maximum mission satellite. Final report, 16 October 1984-15 April 1986, 12:17041 (R;US)
COSMIC NUCLEI
Prior to July , 1975 information was indexed to NUCLEI.
Acceleration
Ultraheavy cosmic rays: Propagation and selective acceleration, 12:16936 (RA;US)
Particle Production
Stellar upper mass limit in an OB association and implications for cosmic rays and cosmic abundances, 12:16938 (RA;US)
Ultraheavy cosmic rays: Propagation and selective acceleration, 12:16936 (RA;US)
COSMIC PARTICLES
See COSMIC RADIATION
COSMIC PHOTONS
Prior to July, 1975 information was indexed to PHOTONS.
Secondary Emission
Secondary production of gamma rays in the Jovian magnetosphere, 12:16937 (RA;US)
COSMIC RADIATION
From sources other than the sun; not for SOLAR RADIATION.
See also COSMIC NUCLEI
COSMIC PHOTONS
Energy Spectra
Heavy element compositions and energy spectra of galactic and solar cosmic rays, 12:16940 (R;FR;In French)
Faculae
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Fluctuations
Cosmic ray fluctuations at rigidities 4 to 180 GV, 12:16962 (R;HU)
Measuring Methods
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Meetings
Contributions to the 18th International Cosmic Ray Conference, 12:16935 (R;US)
Monitoring
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
COSMIC RADIO SOURCES
See also BL LACERTAE OBJECTS
PULSARS
QUASARS
SUPERNOVA REMNANTS
Emission Spectra
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)
X Radiation
Variability studies of 3C 371. Final report, 1 April 1985-30 September 1986, 12:16968 (R;US)

COSMIC RAY DETECTION
Neutron Monitors
On the possibility of using a neutron supermonitor in the ANI complex experiment, 12:16604 (R;SU;In Russian)
COSMIC RAY SPECTROMETERS
Data Processing
Design principle and structure of the ANI data centre, 12:16609 (R;SU)
Versatile Data Processing Unit (DPU) for satellite-borne composition instrumentation, 12:16939 (RA;US)
COSMIC X RAYS
See COSMIC PHOTONS
COSMIC X-RAY SOURCES
Emission Spectra
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)
COSMOGONY
See COSMOLOGY
COSMOLOGICAL MODELS
Cosmology and galaxy formation. An introduction to some recent ideas, 12:17048 (R;DK)
Primordial shear and the question of inflation, 12:17047 (R;DK)
Elementary Particles
Inflation in a wall dominated universe, 12:17392 (BA;US)
Hubble Effect
Inflation in a wall dominated universe, 12:17392 (BA;US)
Supersymmetric inflation: Recent progress, 12:17390 (BA;US)
The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
The new inflationary universe, 1984, 12:17389 (BA;US)
Kaluza-Klein Theory
More dimensions - Less inflation, 12:17393 (BA;US)
Mass Distribution
Inflation in a wall dominated universe, 12:17392 (BA;US)
The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
The new inflationary universe, 1984, 12:17389 (BA;US)
Phase Transformations
Inflation in a wall dominated universe, 12:17392 (BA;US)
Supersymmetric inflation: Recent progress, 12:17390 (BA;US)
Reviews
The new inflationary universe, 1984, 12:17389 (BA;US)
Scalar Fields
The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
Supersymmetry
Supersymmetric inflation: Recent progress, 12:17390 (BA;US)
COSMOLOGY
Elementary Particles
Inflation in a wall dominated universe, 12:17392 (BA;US)
Kaluza-Klein Theory
More dimensions - Less inflation, 12:17393 (BA;US)
COSMOS
See UNIVERSE
COSTA RICA
Carbon Cycle
Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
COUNTERFLOW COOLING TOWERS
See COOLING TOWERS
COUNTERS (RADIATION)
See RADIATION DETECTORS
COUNTING CIRCUITS
Automation
Improving the precision and range of cell survival assays, 12:16865 (RA;US)
Design
Improving the precision and range of cell survival assays, 12:16865 (RA;US)
CP INVARIANCE
Symmetry Breaking
CP violation in heavy flavor decays: Predictions and search strategies, 12:17157 (J;NL)
Problems of CP-violation in early unification theories, 12:17162 (R;SU)
CRACK GROWTH
See CRACK PROPAGATION
CRACK PROPAGATION
Finite Element Method
Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack, 12:16291 (R;GB)
CRACKS
Detection
Radiometric detection of cracks on stationary and moving surfaces, 12:15707 (RA;US)
Monitoring
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
CRANES
Failures
Hot canyon crane operating problems and equipment failures: F-Canyon Reprocessing Facility, Savannah River Plant, 12:15386 (R;US)
CRICETULUS
See HAMSTERS
CRITICALITY
Computer Calculations
Different perspectives on the use of personal computers for technical analyses, 12:16449 (J;US)
CRITICALITY ACCIDENTS
See CRITICALITY
RADIATION ACCIDENTS
CROSS SECTIONS
See also TOTAL CROSS SECTIONS
Data Covariances
Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models, 12:17192 (R;US)
CROSSFLOW COOLING TOWERS
See COOLING TOWERS
CRUCIBLES
Materials Testing
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
CRUDE OIL
See PETROLEUM
CRYOPUMPS
Efficiency
Losses in fountain-effect pumps, 12:16443 (R;US)
CRYOSTATS
Stability
Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)
CRYSTAL DEFECTS
Electronic Structure
Theoretical studies of defects in binary and ternary oxides, 12:16329 (R;US)
CRYSTAL RIVER-3 REACTOR
Citrus, Florida, USA
Outages
New time-line technique for station blackout core-melt analysis, 12:16122 (J;US)
Reactor Core Disruption
New time-line technique for station blackout core-melt analysis, 12:16122 (J;US)
CRYSTAL STRUCTURE
See also CRYSTAL DEFECTS
Temperature Dependence
Further aspects of the structure and magnetism of the layered compound Fe(III)ClMoO$_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
CRYSTALS
See also IONIC CRYSTALS
MONOCRYSTALS
POLYCRYSTALS
Physical Radiation Effects
To the theory of radiation-induced pores in crystals, 12:16279 (RA;SU;In Russian)

Porosity
To the theory of radiation-induced pores in crystals, 12:16279 (RA;SU;In Russian)
CTX SPHEROMAK
Electric Conductivity
Local drift parameter, j/n/sub e/ and resistivity anomaly measurements in CTX spheromaks, 12:17450 (RA;US)
Electrodes
Los Alamos Spheromak Program, 12:17447 (RA;US)
Electron Drift
Local drift parameter, j/n/sub e/ and resistivity anomaly measurements in CTX spheromaks, 12:17450 (RA;US)
Magnetic Field Configurations
Determination of CTX equilibria, 12:17448 (RA;US)
Multimode evolution of the decaying spheromak, 12:17460 (RA;US)
Plasma Confinement
Increased particle confinement with the use of external dc bias field in the CTX spheromak, 12:17449 (RA;US)
Los Alamos Spheromak Program, 12:17447 (RA;US)
Plasma Guns
Energy efficiency of the CTX magnetized coaxial plasma source, 12:17452 (RA;US)
Recent helicity source and power supply improvements to CTX, 12:17453 (RA;US)
Plasma Instability
Determination of CTX equilibria, 12:17448 (RA;US)
Power Supplies
Recent helicity source and power supply improvements to CTX, 12:17453 (RA;US)
Pulse Generators
Recent helicity source and power supply improvements to CTX, 12:17453 (RA;US)
CURIUM
Ion Exchange Chromatography
High-sensitive and quantitative in-line monitoring method for transplutonium elements separation processes, 12:15382 (R;CN;In Chinese)
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
CURIUM 248 TARGET
Calcium 48 Reactions
Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
CYANOBACTERIA
Biological Adaptation
Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp, 12:16806 (J;US)
Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa, 12:16807 (J;US)
Phycobilisomes
Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp, 12:16806 (J;US)
Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa, 12:16807 (J;US)
CYCLONE SEPARATORS
Fire Prevention
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
Modifications
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
CYCLOTRONS
See also ISOCHRONOUS CYCLOTRONS
VARIABLE ENERGY CYCLOTRONS
Beam Separators
Some proposals on mass separation, precision mass spectrometry and acceleration of radioactive nuclides, 12:16561 (R;SU;In Russian)
CYLINDERS
Objects of cylindrical shape. For containers see headings such as GAS CYLINDERS.
Crack Propagation
Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack, 12:16291 (R;GB)
Fluid Flow
A laser Doppler method for noninvasive measurement of flow velocity, 12:16478 (R;US)
Rotation
Elastic-plastic finite element analysis of a rotating cylinder containing an internal, axial crack, 12:16291 (R;GB)
CYTOPLASM
Biophysics
Numerical studies of unreactive contractile networks, 12:16802 (J;US)
Dynamic Function Studies
Cell motion, contractile networks, and the physics of interpenetrating reactive flow, 12:16801 (J;US)
Numerical studies of unreactive contractile networks, 12:16802 (J;US)
Flow Models
Cell motion, contractile networks, and the physics of interpenetrating reactive flow, 12:16801 (J;US)
CZECHOSLOVAKIA
Reactor Sites
Present status of geological and geophysical work at selected nuclear power plant sites in Czechoslovakia, 12:15966 (RA;CS;In Czech)

D

D CODES
Deriving properties of systems from properties of parts and lists of connections, 12:17640 (R;US)
D MESONS
Prior to Jan. 1985 this information was indexed with the descriptor D-1865 RESONANCES.
Weak Particle Decay
CP violation in heavy flavor decays: Predictions and search strategies, 12:17157 (J;NL)
D PLUS RESONANCES
See D MESONS
D ZERO RESONANCES
See D MESONS
D-1865 RESONANCES
See D MESONS
DARK REPAIR
See BIOLOGICAL REPAIR
DATA ACQUISITION SYSTEMS
The operator interface for the Mirror Fusion Test Facility, 12:17489 (R;US)
Counting Techniques
High-rate CAMAC aquisition system, 12:16651 (J;NL)
Design
System for automatic monitoring of longwall supports at Angus Place colliery, 12:15321 (R;AU)
Materials Testing
Control and data acquisition system of the RIPS facility for the plastic property irradiation studies, 12:16483 (R;SU;In Russian)
DATA ANALYSIS
Algorithms
Managing the data analysis process, 12:17656 (R;US)
Data Covariances
Uncertainties in scientific measurements, 12:17216 (R;US)
Management
Managing the data analysis process, 12:17656 (R;US)
DATA PROCESSING
Manipulation of unit facts.
Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)

POMNK-programme of experimental data approximation by linear combination of functions, 12:17653 (R;SU;In Russian)
DATA STORAGE DEVICES
See MEMORY DEVICES
DATA TRANSMISSION SYSTEMS
Electronic Circuits
Optical analog data link with simple self-test feature, 12:16495 (P;US)
Frequency Converters
Optical analog data link with simple self-test feature, 12:16495 (P;US)
DC SYSTEMS
Availability
Four-train support always more reliable than a two-train support?, 12:16097 (J;US)
DEAERATORS
Corrosion
Deaerators - design and operation, effect on water chemistry, corrosion problems, 12:15716 (RA;US)
Corrosion Protection
Deaerators - design and operation, effect on water chemistry, corrosion problems, 12:15716 (RA;US)
Operation
Deaerators - design and operation, effect on water chemistry, corrosion problems, 12:15716 (RA;US)
DEBRIS (NUCLEAR)
See FISSION PRODUCTS
DECAY
For nuclear or particle decay only.
See also BETA DECAY
D Codes
DECAN program for determininning parameters of exponential distributions in experiments on the genetically linked radionuclide investigation, 12:17649 (R;SU;In Russian)
Data Processing
Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986, 12:17196 (R;XA)
DECAN program for determininning parameters of exponential distributions in experiments on the genetically linked radionuclide investigation, 12:17649 (R;SU;In Russian)
DECELERATION
See ACCELERATION
DECIMETER WAVE RADIATION (1-3 DM)
See RADIOWAVE RADIATION
DECIMETER WAVE RADIATION (3-10DM)
See RADIOWAVE RADIATION
DECISION MAKING
Surveys
An experiment in combining estimates of uncertainty, 12:16913 (R;US)
DECOMMISSIONING
See also REACTOR DECOMMISSIONING
Environmental Exposure Pathway
Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS, 12:15505 (RA;US)
Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology, 12:15504 (RA;US)
Information Systems
Overview of decommissioning and decontamination technical information support activities funded by the U.S. Department of Energy's remedial action programs, 12:15501 (RA;US)
Radiation Doses
Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS, 12:15505 (RA;US)
Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology, 12:15504 (RA;US)
Regulations
Idaho National Engineering Laboratory release criteria for decontamination and decommissioning, 12:15551 (RA;US)
DECONTAMINATION
Environmental Exposure Pathway
Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS, 12:15505 (RA;US)
Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology, 12:15504 (RA;US)
Information Systems
Overview of decommissioning and decontamination technical information support activities funded by the U.S. Department of Energy's remedial action programs, 12:15501 (RA;US)
Legal Aspects
Legal and ethical issues raised in considering residential decontamination options for technologically-enhanced radioactive contamination, 12:15509 (RA;US)
Radiation Doses
Estimating doses and risks associated with decontamination and decommissioning activities using the CRRIS, 12:15505 (RA;US)
Evaluation of doses and risks from different decontamination and decommissioning strategies using the PRESTO-II methodology, 12:15504 (RA;US)
Regulations
Idaho National Engineering Laboratory release criteria for decontamination and decommissioning, 12:15551 (RA;US)
Remote Handling
Remote methods for decontamination and decommissioning operations, 12:15520 (RA;US)
Site Surveys
Decision making during radiological designation surveys, 12:15496 (RA;US)
Inventory of sites used to develop residual radioactivity criteria, 12:15553 (RA;US)
UMTRA consent form acquisition: a survey of nonrespondents, 12:15497 (RA;US)
Socio-Economic Factors
Legal and ethical issues raised in considering residential decontamination options for technologically-enhanced radioactive contamination, 12:15509 (RA;US)
DECONTAMINATION FACTOR
See DECONTAMINATION
DEEP INELASTIC SCATTERING
Electron Spectroscopy
Note on electron spectrometer requirements for deep inelastic scattering studies, 12:16601 (R;US)
DEFECTS
Not for CRYSTAL DEFECTS.
Sizing
Characterization of flaws using the zeroes of the real and imaginary parts of the ultrasonic scattering amplitude, 12:16485 (J;US)
DEFORMATION
Computer Codes
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
DEFORMED NUCLEI
Interacting Boson Model
Investigation of two-phonon pole shift in deformed nuclei by the boson expansion method, 12:17291 (R;SU)
Random Phase Approximation
Investigation of two-phonon pole shift in deformed nuclei by the boson expansion method, 12:17291 (R;SU)
DEGRADATION (NUCLEAR)
See DECAY
DEHUMIDIFIERS
Heat Pumps
Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)
Internal Combustion Engines
Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)
DELAYED RADIATION INJURIES
See RADIATION INJURIES

DELTA-1236 RESONANCES
Particle Production
Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)
DENMARK
Energy Policy
Wind energy activities in Denmark, 12:15651 (BA;US)
Wind Power
Wind energy activities in Denmark, 12:15651 (BA;US)
DENSITY (ELECTRON)
See ELECTRON DENSITY
DENSITY (ENERGY-LEVEL)
See ENERGY-LEVEL DENSITY
DEOXYPENTOSE NUCLEIC ACID
See DNA
DEOXYRIBONUCLEIC ACID
See DNA
DEPLETION (NUCLEAR FUELS)
See BURNUP
DEPOSITS (GEOLOGICAL)
See GEOLOGIC DEPOSITS
DESERTRON
See SUPERCONDUCTING SUPER COLLIDER
DESERTS
Paleoclimatology
Last pluvial climatic episodes in the deserts of southwestern North America, 12:16696 (J;GB)
DESIGN
Data Base Management
Bechtel automated control of design document data, 12:15820 (J;US)
DESIGN BASIS ACCIDENTS
Fission Products
Modeling of Ge(Li) gamma-ray spectra, 12:16126 (J;US)
DESORPTION
Krypton 84 Beams
MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)
Silver 107 Beams
MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)
Xenon 132 Beams
MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)
DESOXYRIBONUCLEIC ACID
See DNA
DETECTION (RADIATION)
See RADIATION DETECTION
DETECTORS (RADIATION)
See RADIATION DETECTORS
DEUTERIUM
Trapping
Trapping of deuterium in argon-implanted nickel, 12:16302 (J;US)
DEUTERIUM IONS
Ion Sources
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Spectroscopic investigation of H^- and D^- ion source plasmas, 12:16564 (R;US)
DEUTERIUM OXIDES
See HEAVY WATER
DEUTERIUM TARGET
Deuteron Reactions
Investigation of charge symmetry violation in d+d mirror reactions at low energies, 12:17278 (RA;CS)
Electron Reactions
Nuclear physics with internal targets in electron storage rings, 12:17203 (R;US)
Muon Reactions
Measurement of the muon capture rate in liquid deuterium by the lifetime technique, 12:17204 (R;FR)
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
Spin Orientation
Development of a polarized deuterium target by spin exchange with optically pumped K, 12:16540 (R;US)
DEUTERIUM-LITHIUM HIGH FLUX NEUTRON SOURC
See NEUTRON SOURCE FACILITIES
DEUTERON REACTIONS
Breakup Reactions
Deuteron break up in Coulomb field of nuclei, 12:17297 (R;SU;In Russian)
Charge Conservation
Investigation of charge symmetry violation in d+d mirror reactions at low energies, 12:17278 (RA;CS)
Elastic Scattering
Deuteron break up in Coulomb field of nuclei, 12:17297 (R;SU;In Russian)
Polarized Products
Investigation of charge symmetry violation in d+d mirror reactions at low energies, 12:17278 (RA;CS)
DEUTERON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET
DEUTERON REACTIONS
DEUTERONS
Bag Model
Quarks degrees of freedom and deuteron static moments, 12:17287 (R;SU)
Correlations
Multiplicity dependent light particle correlations in $^{40}Ar + ^{197}Au$ reaction at E/A = 60 MeV, 12:17236 (R;FR)
DEVELOPING COUNTRIES
See also ARGENTINA
BANGLADESH
BOLIVIA
BRAZIL
COSTA RICA
CZECHOSLOVAKIA
INDIA
INDONESIA
MEXICO
PANAMA
PERU
REPUBLIC OF KOREA
TURKEY
Electric Power
Financing electric power in developing countries, 12:15884 (RA;XA)
Nuclear Power
Costs and financing of nuclear power programmes in developing countries. Proceedings of a seminar held in Vienna, 9-12 September 1985, 12:15881 (R;XA)
Nuclear power costs in developing countries, 12:15885 (RA;XA)
Nuclear project finance in developing countries: The multi-country financing alternative, 12:15894 (RA;XA)
Presentation of the results of the seminar on cost and financing of nuclear power programmes in developing countries, 12:15878 (RA;XA)
Sharing of benefits and risks in regard to the establishment of nuclear power programmes in developing countries, 12:15890 (RA;XA)
Status of and perspectives and constraints for nuclear power in developing countries, 12:15882 (RA;XA)
Nuclear Power Plants
Nuclear power plants and project finance, 12:15897 (RA;XA)
Sales of nuclear power stations to developing countries: Risk assessment for export credit insurance, 12:15895 (RA;XA)
Power Demand
Financing electric power in developing countries, 12:15884 (RA;XA)
Power Reactors
Interregional technical co-operation project on small and medium power reactors, 12:15880 (RA;XA)
Presentation of main results of Phase I of the SMPR project initiation study, 12:15877 (RA;XA)
DIABLO CANYON-1 REACTOR
Avila Beach, California, USA
Emergency Plans
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Reactor Cooling Systems
Plant experience with temporary reverse osmosis makeup water systems, 12:15824 (J;US)

Reactor Cores
PC-based flux mapping data collection system, 12:15829 (J;US)
Reactor Licensing
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)

DIABLO CANYON-2 REACTOR
Avila Beach, California, USA
Emergency Plans
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Reactor Cooling Systems
Plant experience with temporary reverse osmosis makeup water systems, 12:15824 (J;US)
Reactor Licensing
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)

DIAPHRAGMS (THERMONUCLEAR DEVICE)
See LIMITERS

DIELDRIN
Biodegradation
Preliminary investigation of organisms capable of degrading dieldrin and aromatic compounds: techniques for isolation and characterization, 12:16830 (RA;US)

DIESEL ENGINES
Air Pollution Monitoring
A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)
Design
Compound cycle engine program, 12:16228 (R;US)
Fuel Substitution
A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)
Research Programs
Compound cycle engine program, 12:16228 (R;US)

DIESEL FUELS
Exhaust Gases
Comparative in vitro and in vivo models of cytotoxicity and genotoxicity, 12:16901 (RA;US)

DIESEL OIL (FRACTION)
See DIESEL FUELS

DIETHYLENETRIAMINEPENTAACETIC ACID
See DTPA

DIFFERENTIAL EQUATIONS
Numerical Solution
CALTECH: DOE program on numerical analysis, computing and fundamental studies in fluid mechanics: Summary report No. 12, April 1, 1986-March 31, 1987, 12:17087 (R;US)

DIFFUSION
Chemical potential in a stressed solid, 12:17341 (R;US)

DIGESTER GAS
See METHANE

DIOPSIDE
Cobalt
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Nickel
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Phase Studies
Direct measurement of the enthalpy of fusion of diopside, 12:16927 (J;US)
Temperature Effects
Direct measurement of the enthalpy of fusion of diopside, 12:16927 (J;US)

DIPHENYLPHOSPHINE OXIDE
See ORGANIC PHOSPHORUS COMPOUNDS

DIRAC EQUATION
Potentials
External field Dirac equation with separable potential, 12:17383 (R;HU)
Vacuum States
Probing for Dirac vacuum structure in nuclei, 12:17300 (J;NL)

DIRAC MONOPOLES
See MAGNETIC MONOPOLES

DIRECT ENERGY CONVERTERS
See also FUEL CELLS
MHD GENERATORS
RADIOISOTOPE BATTERIES
Design
Direct converter design for the MINIMARS Tandem Mirror Reactor, 12:17555 (J;US)

DIRECT GAIN SYSTEMS
Prior to September 1980 HEAT GAIN was used to index this concept.
Computerized Simulation
PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)
P Codes
PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)
Phase Change Materials
PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)

DISCHARGES (ELECTRIC)
See ELECTRIC DISCHARGES

DISINTEGRATION (NUCLEAR)
See DECAY

DISMANTLING (FUEL ASSEMBLY)
See FUEL ASSEMBLY DISMANTLING

DISMANTLING (REACTOR)
See REACTOR DISMANTLING

DISPLACEMENT RATES
Embrittlement
Calculation of damage cross section, 12:17305 (R;IN)
Neutron Reactions
Calculation of damage cross section, 12:17305 (R;IN)

DISSOLVED MATERIALS
See SOLUTES

DISSOLVED OXYGEN
See OXYGEN

DISTRICT HEATING
Cogeneration
Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation, 12:15670 (R;DE;In German)
Dual-Purpose Power Plants
Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation, 12:15670 (R;DE;In German)
Short-distance heat supply in Rottweil with cogeneration systems and heat pumps, 12:15675 (RA;DE;In German)
Strengths and weaknesses of cogeneration units - application of small and medium size cogeneration plants in short-distance heating systems, 12:15672 (RA;DE;In German)
Pipelines
Simulation of heat losses and ground temperatures for district-heating culverts. Comparison with field experiments for well-insulated, damaged, and extra-insulated culverts, 12:16227 (R;US)

DNA
See also RECOMBINANT DNA
Autoradiography
DNA synthesis studies in pre-meiotic mouse oogenesis, 12:16842 (J;CH)
Biological Radiation Effects
Three methods to determine the yields of DNA double-strand breaks, 12:16858 (R;SU)
Electrophoresis
Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers, 12:16882 (J;US)

DNA ADDUCTS
Chemical Analysis
Analysis of DNA adducts using trace organic analytical techniques, 12:16896 (RA;US)

DOGS
Biological Radiation Effects
Collaborative Radiological Health Laboratory annual report 1985: health effects of prenatal and postnatal whole-body exposure to ionizing radiation in the beagle dog, 12:16860 (R;US)

Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
DOLOMITE
Fluid Flow
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
Hydrology
A modeling study of the Culebra dolomite, 12:16921 (R;US)
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
DOMESTIC WASTES
See MUNICIPAL WASTES
DONKEYS
See BURROS
DOORS
Seals
Close-fitting shield doors with sculptured edges, 12:15391 (J;US)
DOPAMINE
Receptors
Improved delineation of human dopamine receptors using [18F]-N-methylspiroperidol and PET, 12:16816 (J;US)
DORMITORIES
See RESIDENTIAL BUILDINGS
DOSE LIMITS
Standards
Dose guidelines for decontamination and decommissioning projects, 12:15493 (RA;US)
National and international considerations of a de minimis dose, 12:15491 (RA;US)
DOSE RATES
S Codes
SHARDA - a program for sample heat, activity, reactivity and dose analysis, 12:17304 (R;IN)
DOSEMETERS
Sensitivity
Personnel neutron dosimetry using CR-39 foils, 12:16879 (R;US)
DOSIMETERS
See DOSEMETERS
DOUBLE BETA DECAY
Lepton Number
Lepton number non-conservation and double beta decay, 12:17107 (RA;CS)
DOW PUSHER 700
See POLYAMIDES
DPA
See DISPLACEMENT RATES
DPO
See ORGANIC PHOSPHORUS COMPOUNDS
DRIFT CHAMBERS
Cylindrical Configuration
New drift chamber for the Mark II detector at the SLAC linear collider, 12:16653 (J;NL)
Design
Drift-pots for small angle elastic scattering at the Fermilab collider, 12:16657 (J;NL)
Performance
Performance of the SLD central drift chamber prototype, 12:16658 (J;NL)
Prototype results of a high resolution vertex drift chamber for the Mark II SLC upgrade detector, 12:16659 (J;NL)
Spatial Resolution
Rectangular drift tube characteristics, 12:16617 (R;SU)
Time Resolution
Rectangular drift tube characteristics, 12:16617 (R;SU)
Using pulse fall of a drift proportional tube for time resolution improvement, 12:16618 (R;SU;In Russian)
DRILL CORES
Reactivity
Reactivity analyses of Schlumberger samples, 12:16923 (R;US)
DRILL SHIPS
See OFFSHORE PLATFORMS
SHIPS
DRILLING PLATFORMS
See OFFSHORE PLATFORMS
DRINKING WATER
Design of a drinking-water-quality monitoring program, 12:16783 (R;US)
DROPLETS
Explosions
A self-similar approach to the explosion of droplets by a high energy laser beam, 12:17386 (R;US)
DRY-TYPE COOLING TOWERS
See COOLING TOWERS
D-T REACTORS
Breeding Blankets
Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)
Materials Testing
Tritium breeding materials, 12:17628 (BA;US)
Performance
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
Research Programs
Deuterium driven D - T fusion reactor test facility, 12:17587 (J;US)
Test Facilities
Deuterium driven D - T fusion reactor test facility, 12:17587 (J;US)
Thermonuclear Fuels
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
DTO
See HEAVY WATER
TRITIUM COMPOUNDS
DTPA
Chemical Reactions
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Labelling
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
DUAL-PURPOSE POWER PLANTS
Availability
Strengths and weaknesses of cogeneration units - application of small and medium size cogeneration plants in short-distance heating systems, 12:15672 (RA;DE;In German)
Cogeneration
Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation, 12:15670 (R;DE;In German)
Supply-technical, operational, and energy-political assessment of cogeneration plants, 12:15674 (RA;DE;In German)
Economics
Short-distance heat supply in the Ruelzheim recreation center by means of a cogeneration unit and heat pumps, 12:15676 (RA;DE;In German)
Supply-technical, operational, and energy-political assessment of cogeneration plants, 12:15674 (RA;DE;In German)
Energy Conservation
Short-distance heat supply in Rottweil with cogeneration systems and heat pumps, 12:15675 (RA;DE;In German)
Energy Supplies
Short-distance heat supply - introduction, 12:16216 (RA;DE;In German)
Supply-technical, operational, and energy-political assessment of cogeneration plants, 12:15674 (RA;DE;In German)
Heat Pumps
Combination technique: Gas heat pump/cogeneration unit - tandem heating power heat pumps, energy concept of Siemens AG, 12:15678 (RA;DE;In German)
Short-distance heat supply in the Ruelzheim recreation center by means of a cogeneration unit and heat pumps, 12:15676 (RA;DE;In German)

Internal Combustion Engines
Combination technique: Gas heat pump/cogeneration unit - tandem heating power heat pumps, energy concept of Siemens AG, 12:15678 (RA;DE;In German)
Field of application of cogeneration plants with large engines, 12:15673 (RA;DE;In German)
Systems of short-distance heat supply in modular technique, 12:15671 (RA;DE;In German)
Operation
Experiences made during planning and operation of a big cogeneration unit in a municipal facility, 12:15677 (RA;DE;In German)
Planning
Experiences made during planning and operation of a big cogeneration unit in a municipal facility, 12:15677 (RA;DE;In German)

DUBNA PULSED REACTOR
See IBR-2 REACTOR

DUCTILITY
Dynamic Loads
Ductility of materials under dynamic solicitations, 12:16243 (R;FR;In French and English)

DUKOVANY V-2 REACTOR
Dukovany, South Moravia, Czechoslovakia
Buildings
Dynamic measurement on main generating unit of Dukovany Nuclear Power Plant, 12:16056 (RA;CS;In Czech)
Occupational Safety
Safety work organization in nuclear power plant. A9. Volume 1, 12:17637 (R;CS;In Czech)
Safety work organization in nuclear power plant. A9. Volume 2. Annexes, 12:17638 (R;CS;In Czech)
Seismic Effects
Seismic load calculation for primary circuit of Dukovany Nuclear Power Plant, 12:16053 (RA;CS;In Czech)

DUSTS
See also COSMIC DUST
Air Pollution Control
Field evaluation of windscreens as a fugitive dust control measure for materials storage piles, 12:16704 (RA;US)
Process fugitive particulates - design methods for enclosures, 12:16703 (RA;US)
Air Pollution Monitoring
Measurement of fugitive emissions in a coal-fired power plant, 12:15753 (RA;US)
Indoor Air Pollution
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)

DYE LASERS
Rhodamines
Bibliographic study of photophysical and photochemical properties of laser dyes, 12:16465 (R;FR;In French)

DYMAC SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM

DYNAMIC MATERIALS ACCOUNTABILITY SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM

DYSPROSIUM
Activation Analysis
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

DYSPROSIUM 160 TARGET
Neutron Reactions
Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy, 12:17231 (RA;CS)

DYSPROSIUM 162 TARGET
Neutron Reactions
Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy, 12:17231 (RA;CS)

DYSPROSIUM 164 TARGET
Neutron Reactions
Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy, 12:17231 (RA;CS)

E

EARLY RADIATION INJURIES
See RADIATION INJURIES

EARTH ATMOSPHERE
See also IONOSPHERE
STRATOSPHERE
TROPOSPHERE
Environmental Transport
Atmospheric CO/sub 2/ variations based on the tree-ring 13/sub C/ record, 12:16766 (BA;US)
Spectroscopy
HALOE science investigation. Semiannual progress report, February-July 1986, 12:16705 (R;US)

EAST PAKISTAN
See BANGLADESH

EBR-2 REACTOR
Computerized Control Systems
An approach to the verification of a fault-tolerant, computer-based reactor safety system: A case study using automated reasoning: Volume 2, Appendixes: Interim report, 12:16028 (R;US)
Fuel Element Failure
Breached pin performance in the EBR-II RBCB program, 12:15977 (R;US)
Fuel Elements
Thermal impact of $Na_3(U/sub\ 1\text{-}y/Pu/sub\ y/)O_4$ formation on a breached LMR fuel element, 12:15980 (R;US)
Lifetime
An integrated plant-life extension program for EBR-II [Experimental Breeder Reactor], 12:15975 (R;US)
Nuclear Fuels
Experience with EBR-II [Experimental Breeder Reactor] driver fuel, 12:15979 (R;US)
Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel, 12:16016 (R;US)
Reactor Components
Comparisons of PRD [power-reactivity-decrements] components for various EBR-II configurations, 12:15974 (R;US)
Reactor Cores
Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime, 12:15865 (J;US)
Reactor Instrumentation
EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software, 12:15976 (R;US)
Reactor Kinetics
Delineations of power and power-to-flow feedback components of EBR-II, 12:15863 (J;US)
Reactor Operation
An integrated plant-life extension program for EBR-II [Experimental Breeder Reactor], 12:15975 (R;US)
EBR-II [Experimental Breeder Reactor-II] system surveillance using pattern recognition software, 12:15976 (R;US)
Off-normal performance of EBR-II [Experimental Breeder Reactor] driver fuel, 12:16016 (R;US)
Time constants and feedback transfer functions of EBR-II [Experimental Breeder Reactor] subassembly types, 12:15973 (R;US)

ECCS
Design
Passive steam-driven injector as ECCS for an inherently safe BWR, 12:16078 (J;US)

ECONOMIC ANALYSIS
Uses
Applications of economic analysis in gas distribution, 12:15368 (R;US)

ECR HEATING
Free Electron Lasers
Free electron masers for tokamak applications, 12:17542 (J;US)
Masers
Free electron masers for tokamak applications, 12:17542 (J;US)

EDDY CURRENTS
Limited to electric currents.

Mathematical Models
Experimental modelling of eddy currents and deflection for tokamak limiters, 12:17584 (J;US)
EDTA
Chemical Reactions
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Labelling
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
EFFECTIVE HALF-LIFE
See BIOLOGICAL HALF-LIFE
EFFLUENTS (CHEMICAL)
See CHEMICAL EFFLUENTS
EFFLUENTS (LIQUID)
See LIQUID WASTES
EFFUSION
See DIFFUSION
EHF RADIATION
See MICROWAVE RADIATION
EIGENVALUES
Algorithms
Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions, 12:17668 (BA;US)
EINSTEIN GRAVITATION THEORY
See GENERAL RELATIVITY THEORY
EINSTEIN-DE SITTER MODEL
See COSMOLOGICAL MODELS
EINSTEINIUM 253
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
EINSTEINIUM 254 TARGET
Calcium 48 Reactions
Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
EKU
See EREVAN SYNCHROTRON
ELECTRIC BATTERIES
Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.
Heating
Battery thermal modeling: The methodology and applications, 12:16148 (R;US)
Specifications
Batteries for hybrid vehicles or other high-power applications, 12:16234 (R;US)
Temperature Distribution
Battery thermal modeling: The methodology and applications, 12:16148 (R;US)
ELECTRIC CABLES
See also COAXIAL CABLES
Electrical Insulation
High-voltage cable lead-in for pulse techniques, 12:17485 (R;SU;In Russian)
ELECTRIC CONTACTS
Fabrication
Ink jet printing of silver metallization for photovoltaics: Final technical report for the period 10/1/84 through 9/30/86, 12:15607 (R;US)
Silicon solar cells with polysilicon contacts, 12:15612 (R;US)
Testing
Environmental tests of metallization systems for terrestrial photovoltaic cells, 12:15603 (R;US)
Thermal Cycling
Environmental tests of metallization systems for terrestrial photovoltaic cells, 12:15603 (R;US)
ELECTRIC DISCHARGES
Bibliographies
A bibliography and author index for electrical discharges in vacuum (1897-1984), 12:15667 (R;US)
ELECTRIC GENERATORS
Rotating generators only; excludes DIRECT ENERGY CONVERTERS.
See also ALTERNATORS
TURBOGENERATORS
Reliability
Emergency diesel generator reliability at US nuclear power plants, 12:16124 (J;US)
ELECTRIC POWER
Economics
Preparation and appraisal of electric power projects, 12:15898 (RA;XA)
Financing
Financing electric power in developing countries, 12:15884 (RA;XA)
Preparation and appraisal of electric power projects, 12:15898 (RA;XA)
Power Generation
Annual report of the electric power industry of the Federal Republic of Germany 1985. (Summary of the quarterly reports). Power generation in publicly-owned electric utilities, the industrial independent units and the Federal Railways and overall the electric power consumption in the Federal Republic of Germany, 12:16175 (R;DE;In German)
Uses
The role of electricity in glass making, 12:16217 (R;US)
ELECTRIC POWER RESEARCH INSTITUTE
See EPRI
ELECTRIC POWER SYSTEMS
See POWER SYSTEMS
ELECTRIC UTILITIES
Cooperatives
Economic challenges facing rural electric cooperatives, 12:16171 (R;US)
Data Compilation
Electric power monthly, October 1986, 12:16172 (R;US)
Economics
Economic challenges facing rural electric cooperatives, 12:16171 (R;US)
Energy Conservation
Determining the extent, benefits, cost, and timing of utility conservation and load management programs, 12:16173 (R;US)
Economic challenges facing rural electric cooperatives, 12:16171 (R;US)
Fuel Consumption
Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)
Load Analysis
Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report, 12:16174 (R;US)
Load Management
Determining the extent, benefits, cost, and timing of utility conservation and load management programs, 12:16173 (R;US)
Management
Concept of prudence and its impact, 12:16180 (J;US)
Nuclear rate regulation, 12:15914 (J;US)
Schedule reconciliation tests for management prudency determination, 12:15915 (J;US)
Search for excellence - goal setting, Ontario Hydro Nuclear Generation experience, 12:15840 (J;US)
Utility prudency issues, 12:15916 (J;US)
Program Management
Can nuclear power survive rate-of-return regulation?, 12:16178 (J;US)
Electric utility regulation - today and tomorrow, 12:16177 (J;US)
Planning for rate base treatment of large power plants, 12:16179 (J;US)
Winning the rate base battle, 12:16176 (J;US)
Rate Structure
Economic challenges facing rural electric cooperatives, 12:16171 (R;US)

Technology Transfer
EEI chemistry committee perspective - current US utility practices (Edison Electric Institute), 12:15719 (RA;US)

ELECTRICAL EQUIPMENT
See also ELECTRIC CONTACTS
ELECTRICAL INSULATORS
ELECTROMAGNETS
Reliability
Identification of test candidates for investigating the survivability of electrical equipment during severe accidents, 12:16120 (J;US)
Seismic Effects
Earthquake resistance problems of electric equipment, 12:16042 (RA;CS;In Czech)
Testing
Identification of test candidates for investigating the survivability of electrical equipment during severe accidents, 12:16120 (J;US)

ELECTRICAL INSULATION
Electromagnetic Pulses
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)

ELECTRICAL INSULATORS
Testing
Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines, 12:15760 (R;US)

ELECTRICITE DE FRANCE
Research Programs
DER 85: main facts, 12:15798 (R;FR;In French)

ELECTRICITY
Only for the physical phenomenon sense; for utility purposes, use ELECTRIC POWER.
Production
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report], 12:16420 (R;US)

ELECTRIC-POWERED VEHICLES
See also HYBRID ELECTRIC-POWERED VEHICLES
Research Programs
Battery-powered vehicle research in South Africa, 12:16233 (R;ZA)

ELECTRODEPOSITION
Manuals
Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)

ELECTRODES
Interfaces
Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987, 12:16423 (R;US)

ELECTROMAGNETIC ISOTOPE SEPARATORS
Meetings
Proceedings of the specialist research meeting on measurements of short-lived isotopes, 12:16646 (R;JP;In Japanese)
Seconds Living Radioisotopes
Proceedings of the specialist research meeting on measurements of short-lived isotopes, 12:16646 (R;JP;In Japanese)

ELECTROMAGNETIC LENSES
Beam Transport
Application of graphical design method to beam transport system, 12:16521 (R;CN;In Chinese)
Magnetic Fields
Quadrupole lense field potential determination by the boundary integral eguation method, 12:16527 (R;SU;In Russian)

ELECTROMAGNETIC PULSES
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)
Simulation of geomagnetic currents induced in a power system by magnetohydrodynamic electromagnetic pulses, 12:15666 (R;US)

ELECTROMAGNETS
See also SUPERCONDUCTING MAGNETS
Magnetic Flux
Two dimensional analysis for magnetic flux distribution in electromagnet used for MHD applications, 12:17086 (R;IN)

ELECTRON ACCEPTOR
See ELECTRONS

ELECTRON BEAMS
Convective Instabilities
Manifestation of sleeping-instability in partially-compensated relativistic electron beams, 12:16525 (RA;SU;In Russian)

ELECTRON CHANNELING
Multiple Scattering
Suppression of multiple scattering at planar channeling of negative particles, 12:17070 (R;SU)

ELECTRON CYCLOTRON-RESONANCE HEATING
See ECR HEATING

ELECTRON DENSITY
Plasma Diagnostics
Method to measure the suprathermal density distribution by electron cyclotron emission, 12:17406 (R;DE)

ELECTRON DONOR
See ELECTRONS

ELECTRON DOSIMETRY
Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards, 12:17331 (R;US)

ELECTRON GUNS
High-Voltage Pulse Generators
Pulse voltage generator for electron cannon supply, 12:16560 (R;SU;In Russian)

ELECTRON MICROSCOPY
Surface Properties
Electron and ion beams in surface investigation of solids, 12:17345 (RA;CS)

ELECTRON REACTIONS
Deep Inelastic Scattering
Note on electron spectrometer requirements for deep inelastic scattering studies, 12:16601 (R;US)
Inelastic Scattering
Random phase approximation, 12:17286 (R;FR)
Semiclassical Approximation
Random phase approximation, 12:17286 (R;FR)

ELECTRON SPECTROMETERS
Note on electron spectrometer requirements for deep inelastic scattering studies, 12:16601 (R;US)
Particle Identification
Identification of electrons by means of a scintillation telescope at Esub(e) = 1-3 GeV, 12:16606 (R;SU;In Russian)

ELECTRONIC DATA PROCESSING
See DATA PROCESSING

ELECTRONIC EQUIPMENT
See also AMPLIFIERS
ANALOG-TO-DIGITAL CONVERTERS
MICROWAVE EQUIPMENT
BARC
Biennial report for 1982 and 1983 of Electronics Division, 12:16593 (R;IN)

ELECTRON-MOLECULE COLLISIONS
Dissociation
Dissociative electron attachment, 12:17075 (RA;CS)

ELECTRON-POSITRON INTERACTIONS
On pair production of Majorana particles in collisions of polarized e/sup +/ and e/sup -/, 12:17147 (R;SU;In Russian)
Annihilation
Production of mirror fermions near the Z/sup 0/ peak, 12:17156 (J;NL)
Jets
Jets in e/sup +/-e/sup -/ collisions, 12:17110 (RA;CS)
Standard Model
Electroweak interactions and new particle searches, 12:17135 (RA;CS)

ELECTRON-RING ACCELERATORS
Electric Fields
On tolerances for random perturbations of accelerating electric field in the KUTI-20 induction accelerating system (LUEhK-20), 12:16526 (R;SU;In Russian)

ELECTRONS
See also SOLVATED ELECTRONS

Acceleration
Particle acceleration by turbulent plasmas, 12:16946 (RA;CS)
Amplitudes
Optimum undulator trajectories, 12:16532 (BA;US)
Chemical Reaction Yield
Total ion and electron yields, 12:17318 (RA;US)
Differential Cross Sections
Structured ion impact: double differential cross sections, 12:17316 (RA;US)
Motion
Optimum undulator trajectories, 12:16532 (BA;US)
Trajectories
Optimum undulator trajectories, 12:16532 (BA;US)

ELECTROSTATIC ACCELERATORS
See also TANDEM ELECTROSTATIC ACCELERATORS
Reliability
Reliability of high-voltage electron accelerators, 12:16514 (R;SU;In Russian)

ELECTROSTATIC ANALYZERS
Beam Optics
Electrostatic separator of total fusion reaction products in the heavy ion beam of Vasilisa installation, 12:16640 (R;SU;In Russian)

ELECTROSTATIC PRECIPITATORS
Design
Advanced ESFF applied to a stoker coal-fired boiler (Electrically stimulated fabric filtration), 12:15311 (RA;US)
Design of repairs to upgrade 10-year-old industrial precipitators, 12:15313 (RA;US)
Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Economic Analysis
Economics of advanced electrostatic stimulation of fabric filtration, 12:15743 (RA;US)
Fire Prevention
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
Mathematical Models
Mathematical model for advanced electrically stimulated fabric filtration, 12:15740 (RA;US)
Study of electrostatically stimulated filtration fundamentals, 12:15739 (RA;US)
Modifications
Performance improvement history of inadequately performing precipitators, 12:15751 (RA;US)
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
Operation
Advanced electrostatic fabric filtration experience at Southwestern Public Service Company, 12:15742 (RA;US)
Performance
Advanced electrostatic fabric filtration experience at Southwestern Public Service Company, 12:15742 (RA;US)
Performance Testing
Advanced ESFF laboratory test results (Electrically stimulated fabric filtration), 12:15741 (RA;US)
Advanced ESFF applied to a stoker coal-fired boiler (Electrically stimulated fabric filtration), 12:15311 (RA;US)
Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Performance improvement history of inadequately performing precipitators, 12:15751 (RA;US)
Study of electrostatically stimulated filtration fundamentals, 12:15739 (RA;US)
Repair
Design of repairs to upgrade 10-year-old industrial precipitators, 12:15313 (RA;US)

ELECTROSTATIC WAVES
See PLASMA WAVES

ELEMENTARY PARTICLES
See also BEAUTY PARTICLES
CHARM PARTICLES
HADRONS
LEPTONS
POSTULATED PARTICLES
Survey of research in elementary particle physics, 12:17128 (R;FR;In French)
Abundance
Inflation in a wall dominated universe, 12:17392 (BA;US)
Origin
Inflation in a wall dominated universe, 12:17392 (BA;US)

ELEMENTS
For chemical elements only.
See also METALS
Absorption Spectra
Micro-tomography using synchrotron radiation, 12:16397 (BA;US)
Air Pollution Monitoring
Plume washout and wet deposition of trace elements around the coal-fired power plant, 12:15318 (R;JP;In Japanese)
Computerized Tomography
Micro-tomography using synchrotron radiation, 12:16397 (BA;US)
Deposition
Plume washout and wet deposition of trace elements around the coal-fired power plant, 12:15318 (R;JP;In Japanese)

ELMO BUMPY TORUS
Plasma Confinement
The "ring killer" experiment: Electron confinement in the ELMO Bumpy Torus without the influence of hot-electron rings, 12:17415 (R;US)

EMC EFFECT
Experimental comparison of EMC effect in the anti *νn* and anti *νp* interactions in neon nucleus, 12:17114 (R;SU)

EMERGENCIES
See ACCIDENTS

EMERGENCY CORE COOLING SYSTEM
See ECCS

EMP
See ELECTROMAGNETIC PULSES

EMPLOYEES
See PERSONNEL

END USE SECTOR
See COMMERCIAL SECTOR
INDUSTRY
RESIDENTIAL SECTOR
TRANSPORTATION SECTOR

ENDONUCLEASES
Enzyme Activity
Levels of uracil DNA glycosylase and AP endonuclease in murine B- and T-lymphocytes do not change with age, 12:16798 (J;CH)

ENERGY
See also NUCLEAR ENERGY
SOLAR ENERGY
Production
Performance profiles of major energy producers, 1985, 12:16155 (R;US)

ENERGY ABSORPTION
Biophysics
Measurement of energy deposition near heavy ion tracks, 12:17320 (RA;US)
Monte Carlo Method
Monte Carlo calculation of energy deposition and ionization yield for high energy protons, 12:17324 (RA;US)

ENERGY CONSUMPTION
See also FUEL CONSUMPTION
Long-term energy projections and novel energy systems, 12:16198 (BA;US)
Environmental Impacts
Global energy and carbon dioxide, 12:16701 (R;US)
Sectoral Analysis
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)

ENERGY DEPOSITION
See ENERGY ABSORPTION

ENERGY MODELS
O Codes
Sensitivity analysis of ORION (Replacement cost of petroleum), 12:15362 (R;US)

ENERGY OPERATORS
See HAMILTONIANS
ENERGY POLICY
Decision Making
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Planning
Energy R & D - A national opportunity, 12:16167 (BA;US)
ENERGY SOURCE DEVELOPMENT
Environmental Impact Statements
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
ENERGY STORAGE SYSTEMS
Heat Transfer
Cryogenic regenerators, 12:16438 (R;IN)
ENERGY SUPPLIES
Economics
Energy supply in communities and industry: Short-distance heat supply - economical and unhazardous to the environment. Documentation, 12:15670 (R;DE;In German)
Energy Policy
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Forecasting
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Sectoral Analysis
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
ENERGY SYSTEMS
Use only in generic sense; e.g., comparisons of several energy systems or theoretical studies when system is not denoted specifically.
See also ENERGY STORAGE SYSTEMS
HOT-DRY-ROCK SYSTEMS
LIGHTING SYSTEMS
NATURAL GAS DISTRIBUTION SYSTEMS
POWER SYSTEMS
STEAM SYSTEMS
Data Analysis
Energy division: Annual progress report for period ending September 30, 1982, 12:16154 (R;US)
Economic Analysis
Energy division: Annual progress report for period ending September 30, 1982, 12:16154 (R;US)
Energy Analysis
Energy division: Annual progress report for period ending September 30, 1982, 12:16154 (R;US)
Environmental Impacts
Energy division: Annual progress report for period ending September 30, 1982, 12:16154 (R;US)
ENERGY-LEVEL DENSITY
Compound-Nucleus Reactions
Particle-hole state densities for statistical multi-step compound reactions, 12:17268 (RA;CS)
Precompound-Nucleus Emission
Particle-hole level densities in the approximation of homogeneous spectrum of single particle levels, 12:17269 (RA;CS)
Shell Models
New results obtained by the number theoretical description of the level densities of nuclei, 12:17270 (RA;CS)
ENGINEERED SAFETY SYSTEMS
See also CONTAINMENT SYSTEMS
ECCS
Availability
Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
ENGLAND
See UNITED KINGDOM
ENHANCED RECOVERY
See also MICROBIAL EOR
Coordinated Research Programs
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
ENVIRONMENTAL MATERIALS
Use only for unspecified samples from the environment. See also specific environmental materials.
Waste Product Utilization
Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)
ENVIRONMENTAL POLICY
Ecology
Problems of decision-making in the fields of biology and ecology under the aspect of environmental policy, 12:16157 (R;DE;In German)
ENVIRONMENTAL TEMPERATURE
See AMBIENT TEMPERATURE
EOR
See ENHANCED RECOVERY
EPOXIDES
Cobalt Ions
Investigation of the effects of cobalt ions on epoxy properties, 12:16363 (R;US)
Mechanical Properties
Investigation of the effects of cobalt ions on epoxy properties, 12:16363 (R;US)
EPOXY COMPOUNDS
See EPOXIDES
EPRI
Feasibility Studies
Electric Power Research Institute (EPRI) study on small and medium power reactor concepts having present potential for the USA, 12:15875 (RA;XA)
Research Programs
EPRI fossil plant cycle chemistry programs, 12:15724 (RA;US)
Overview of RP2712-1, interim consensus guidelines on fossil plant cycle chemistry, 12:15720 (RA;US)
EQUATIONS
See also DIFFERENTIAL EQUATIONS
FADDEEV EQUATIONS
FIELD EQUATIONS
SUM RULES
Algorithms
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
EQUATIONS (DIFFERENTIAL)
See DIFFERENTIAL EQUATIONS
EQUILIBRIUM PLASMA
Magnetic Monopoles
Determination of gross plasma equilibrium from magnetic multipoles, 12:17418 (J;US)
ERBIUM
Magnetic Susceptibility
Magnetic phase transitions in nanocrystalline erbium, 12:16255 (R;US)
Phase Transformations
Magnetic phase transitions in nanocrystalline erbium, 12:16255 (R;US)
EREVAN SYNCHROTRON
Beam Extraction
Characteristics of the Erevan synchrotron extracted electron e/sup -//sub 4/beam, 12:16548 (R;SU;In Russian)
Beam Transport
Calculation and modelling of electron channel with a beam small angular divergence, 12:16544 (R;SU;In Russian)
Erevan accelerator with a beam small angular divergence, 12:16545 (R;SU;In Russian)
Electron Beams
Calculation and modelling of electron channel with a beam small angular divergence, 12:16544 (R;SU;In Russian)
On-Line Measurement Systems
Data acquisition and storage system for the e-A experimental setup on the basis of the Ehlektronika-60 microcomputer, 12:16546 (R;SU;In Russian)

Photon Beams
Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron, 12:16547 (R;SU;In Russian)
Polarized Beams
Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron, 12:16547 (R;SU;In Russian)

EROSION
Mathematical Models
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Test Facilities
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)

ESCHERICHIA COLI
Cell Cycle
Increase in cell mass during the division cycle of Escherichia coli B/rA, 12:16840 (J;US)
Growth
Increase in cell mass during the division cycle of Escherichia coli B/rA, 12:16840 (J;US)
Mutagenesis
Mutants of Escherichia coli affected in inducer exclusion, 12:16825 (RA;US)
Mutants
Mutants of Escherichia coli affected in inducer exclusion, 12:16825 (RA;US)

ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS

ETA MESONS
Particle Production
Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)

ETA-549
See ETA MESONS

ETHANOL
Production
Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae, 12:15590 (R;DE;In German)

ETHYL ALCOHOL
See ETHANOL

ETHYLENEDIAMINETETRAACETIC ACID
See EDTA

EUROPEAN ECONOMIC COMMUNITY
See COMMON MARKET

EUROPEAN MUON COLLABORATION EFFECT
See EMC EFFECT

EUROPIUM
Activation Analysis
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

EVAPORATIVE COOLING
Heat Transfer
Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers, 12:16477 (R;DE;In German)
Mass Transfer
Effect of air and water side heat and material transfer conditions on the evaporation cooling in wet cooling towers, 12:16477 (R;DE;In German)

EVEN-EVEN NUCLEI
Even protons, even neutrons.
See also ARGON 38
BARIUM 138
BERYLLIUM 12
CALCIUM 40
CALCIUM 42
CALCIUM 44
CALCIUM 46
CALCIUM 48
CALIFORNIUM 252
CARBON 12
CHROMIUM 50
CHROMIUM 52
CHROMIUM 54
GERMANIUM 68
GERMANIUM 76
IRON 54
IRON 56
IRON 58
LEAD 210
LEAD 212
OXYGEN 22
PLUTONIUM 238
PLUTONIUM 240
PLUTONIUM 242
PLUTONIUM 244
POLONIUM 210
RADIUM 224
RADIUM 226
RADON 222
SILICON 36
STRONTIUM 90
SULFUR 38
TELLURIUM 132
THORIUM 234
TITANIUM 46
TITANIUM 48
TITANIUM 50
URANIUM 232
URANIUM 234
URANIUM 236
URANIUM 238
Pairing Energy
Method to determine the pairing energy for excited nuclei, 12:17267 (RA;CS)

EXCHANGE (HEAT)
See HEAT TRANSFER

EXCITED STATES
Pairing Energy
Method to determine the pairing energy for excited nuclei, 12:17267 (RA;CS)

EXCITON MODEL
Compound-Nucleus Reactions
Exciton Model and multistep-compound reactions, 12:17266 (RA;CS)

EXHAUST GASES
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Mutagen Screening
Comparative in vitro and in vivo models of cytotoxicity and genotoxicity, 12:16901 (RA;US)

EXPERIMENTAL BREEDER REACTOR-2
See EBR-2 REACTOR

EXPERIMENTAL FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES

EXPERIMENTAL REACTORS
For engineering testing of reactor components such as : FUEL ELEMENTS, COOLING SYSTEMS, etc.
See also EBR-2 REACTOR
HDR REACTOR
SEFOR REACTOR
TREAT REACTOR
VENUS REACTOR
Decommissioning
Measurements and status of a decommissioned experimental reactor - SEFOR, 12:16161 (RA;US)

EXPERT SYSTEMS
Design
Automated reasoning and knowledge base design in the scientific programming environment, 12:17643 (R;US)

EXPOSURE (RADIATION DOSES)
See RADIATION DOSES

EXTENSIVE AIR SHOWERS
Cosmic Ray Detection
Investigation of superhigh-energy cosmic rays (approximately 10/sup 20/eV) by means of a phase interferometer, 12:17057 (RA;SU;In Russian)

EXTRACTION APPARATUSES
Design
Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots, 12:16795 (R;US)

EXTRACTION (SOLVENT)
See SOLVENT EXTRACTION

EXTREMELY HIGH FREQUENCY RADIATION
See MICROWAVE RADIATION

F

F CODES
On the use of CORLIB subroutines for the solution of a model fluid flow problem, 12:17655 (R;US)
FABRIC FILTERS
Cleaning
Catenary analysis of a fabric filter bag during reverse-gas cleaning, 12:15745 (RA;US)
Performance of a high-sulfur-coal, pilot-scale fabric filter, 12:15747 (RA;US)
Design
Advanced ESFF applied to a stoker coal-fired boiler (Electrically stimulated fabric filtration), 12:15311 (RA;US)
Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Economic Analysis
Economics of advanced electrostatic stimulation of fabric filtration, 12:15743 (RA;US)
Materials Testing
Evaluation of acid-resistant synthetic needled felt filter media in coal-fired boiler pulse-jet baghouses, 12:16357 (RA;US)
Evaluation of a specific type of filter bag supplied by various vendors, 12:15744 (RA;US)
Mathematical Models
Aerosol deposition in fabric filters, 12:15746 (RA;US)
Mathematical model for advanced electrically stimulated fabric filtration, 12:15740 (RA;US)
Study of electrostatically stimulated filtration fundamentals, 12:15739 (RA;US)
Operation
Advanced electrostatic fabric filtration experience at Southwestern Public Service Company, 12:15742 (RA;US)
Performance
Advanced electrostatic fabric filtration experience at Southwestern Public Service Company, 12:15742 (RA;US)
Performance Testing
Advanced ESFF laboratory test results (Electrically stimulated fabric filtration), 12:15741 (RA;US)
Advanced ESFF applied to a stoker coal-fired boiler (Electrically stimulated fabric filtration), 12:15311 (RA;US)
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Evaluation of acid-resistant synthetic needled felt filter media in coal-fired boiler pulse-jet baghouses, 12:16357 (RA;US)
Evaluation of a specific type of filter bag supplied by various vendors, 12:15744 (RA;US)
Laboratory studies of the filtration performance of various filter media under simulated field conditions, 12:15312 (RA;US)
Performance of a high-sulfur-coal, pilot-scale fabric filter, 12:15747 (RA;US)
Study of electrostatically stimulated filtration fundamentals, 12:15739 (RA;US)
Stress Analysis
Catenary analysis of a fabric filter bag during reverse-gas cleaning, 12:15745 (RA;US)
FACE CENTERED CUBIC
See FCC LATTICES
FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES
FACILITIES (MILITARY)
See MILITARY FACILITIES
FACILITIES (NUCLEAR)
See NUCLEAR FACILITIES
FACILITIES (STORAGE)
See STORAGE FACILITIES
FACILITIES (TEST)
See TEST FACILITIES
FADDEEV EQUATIONS
Analytical Solution
Solution of Faddeev differential equations for scattering problem in three identical particle system. Calculation algorithm. The finite-dimensional approximation method, 12:17177 (R;SU;In Russian)
FANS
See BLOWERS
FARADAY GENERATORS
See MHD GENERATORS
FAST BREEDER TYPE REACTORS
See FBR TYPE REACTORS
FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR
FAST-MIXED SPECTRUM REACTOR
See FBR TYPE REACTORS
FATIGUE
Crack Propagation
Grain boundary oxidation and fatigue crack growth at elevated temperatures. Final report, 12:16287 (R;US)
FATS
Chemical Radiation Effects
Changes due to radiation or thermal sterilization in vitamin A level, acidity number and peroxide value of various fats in mixes with cereals, 12:16846 (RA;CS;In Czech)
FAULT TOLERANT COMPUTERS
Systems Analysis
Toward formal analysis of ultra-reliable computers: A total systems approach, 12:17644 (R;US)
FBR TYPE REACTORS
See also LMFBR TYPE REACTORS
Neutron Reactions
Measurement and evaluation of nuclear data for nuclear power application, 12:17244 (RA;CS)
Reactor Cores
Physics considerations in the design of long-life cores, 12:15862 (J;US)
FCC LATTICES
Physical Radiation Effects
Production of freely-migrating defects during irradiation, 12:16250 (R;US)
FEDERAL GOVERNMENT
See NATIONAL GOVERNMENT
FEDERAL REGION I
Prior to June 1982 this concept was indexed to NORTH ATLANTIC REGION.
Solar Energy
New England solar energy atlas, 12:15596 (R;US)
FEDERAL REPUBLIC OF GERMANY
Electric Power
Annual report of the electric power industry of the Federal Republic of Germany 1985. (Summary of the quarterly reports). Power generation in publicly-owned electric utilities, the industrial independent units and the Federal Railways and overall the electric power consumption in the Federal Republic of Germany, 12:16175 (R;DE;In German)
Energy Consumption
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Energy Policy
Wind energy utilization status of research and development in the Federal Republic of Germany, 12:15641 (BA;US)
Energy Supplies
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
Environmental Policy
Problems of decision-making in the fields of biology and ecology under the aspect of environmental policy, 12:16157 (R;DE;In German)
Fossil-Fuel Power Plants
Adoption of water chemistry principles in fossil power plant design and operation, 12:15728 (RA;US)
Fuel Consumption
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)

Fuel Reprocessing Plants
Aspects of remote maintenance in an FRG reprocessing plant from the manufacturer's viewpoint, 12:15396 (J;US)
Renewable Energy Sources
Renewable energy sources and their uses - application, potentials, economic aspects, 12:16183 (RA;DE;In German)
Solar Energy
Renewable energy sources and their uses - application, potentials, economic aspects, 12:16183 (RA;DE;In German)
Wind Power
Wind energy utilization status of research and development in the Federal Republic of Germany, 12:15641 (BA;US)

FEED MATERIALS PLANTS
Decommissioning
Correlation between gamma radiation levels and soil radium concentrations at the Edgemont uranium mill site, 12:15549 (RA;US)
Health physics program for the Edgemont Uranium Mill decommissioning project, 12:15498 (RA;US)
Radiation Monitoring
Comparison of the response of a NaI scintillation crystal with a pressurized ionization chamber as a function of altitude, radiation level, and Ra-226 concentration, 12:15530 (RA;US)
Radiation Protection
Environmental monitoring requirements during remedial action and stabilization of uranium mill tailings (UMTRA project), 12:15514 (RA;US)
Site Surveys
Rapid estimation of ^{226}Ra in soil for the Grand Junction RASA/UMTRA Project, 12:15532 (RA;US)

FEEDWATER
Availability
New scenario for intersystem LOCAs in BWRs, 12:16098 (J;US)
Temperature Monitoring
Sound measures feedwater temperature within 1°F consistently, 12:15832 (J;US)
Water Chemistry
Factors affecting boiler water chemistry, 12:15712 (RA;US)
Impact of feedwater chemistry on feedwater heater tubes, 12:15715 (RA;US)
Recommended water chemistry practices for high pressure-drum type boilers, 12:15711 (RA;US)
Steam turbine chemistry - a review, 12:15713 (RA;US)
TUGCO's turbine environment index (Texas Utilities Generating Company), 12:15721 (RA;US)
Water Quality
Babcock & Wilcox Company water chemistry guidelines for once-through steam generators and drum boilers, 12:15710 (RA;US)
Steam purity recommendations - the Westinghouse experience, 12:15714 (RA;US)
Water Treatment
Phosphate and other hide-out, 12:15734 (RA;US)
Steam turbine chemistry - a review, 12:15713 (RA;US)

FEEDWATER HEATERS
Leaks
Leak detection by acoustic emission monitoring in power plant high pressure preheaters, 12:15700 (RA;US)

FELIX FACILITY
Research Programs
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)

FERMENTATION ALCOHOL
See ETHANOL

FERMILAB ACCELERATOR
Facility at Fermi National Accelerator Laboratory, Batavia, Illinois, includes main synchroton, booster synchrotron, and linac.
Buildings
Fermilab Central Computing Facility: Energy conservation report and mechanical systems design optimization and cost analysis study, 12:16550 (R;US)

FERMILAB TEVATRON
Operation
The tevatron energy doubler: A superconducting accelerator, 12:16519 (BA;US)

FERMIONS
See also LEPTONS
Anomalous Dimension
Chiral anomalies and finite-mode regularization of the fermion integral, 12:17168 (R;SU;In Russian)
Axial-Vector Currents
Chiral anomalies and finite-mode regularization of the fermion integral, 12:17168 (R;SU;In Russian)
Chiral Symmetry
Chiral anomalies and finite-mode regularization of the fermion integral, 12:17168 (R;SU;In Russian)
Majorana Theory
On pair production of Majorana particles in collisions of polarized e/sup +/ and e/sup -/, 12:17147 (R;SU;In Russian)
Mass Spectra
Fermion masses in GUTs with intermediate scales, 12:17188 (BA;NL)
Pair Production
On pair production of Majorana particles in collisions of polarized e/sup +/ and e/sup -/, 12:17147 (R;SU;In Russian)

FERRIC COMPOUNDS
See IRON COMPOUNDS

FERRITES
Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Crystal Defects
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Electric Conductivity
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Seebeck Effect
Electronic defects in $LiFeO_2$, 12:16190 (R;US)

FERRITIC STEELS
Brittleness
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Corrosion Products
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Crack Propagation
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Fracture Mechanics
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Physical Radiation Effects
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)

FERROUS COMPOUNDS
See IRON COMPOUNDS

FERTILE MATERIALS
Mathematical Models
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
Swelling
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)

FFTF REACTOR
Westinghouse Hanford Company, Richland, Washington
Cover Gas
Reactor cover gas monitoring at the Fast Flux Test Facility, 12:15984 (R;US)
Fuel Management
FFTF fuel rotation for extended burnup, 12:15996 (J;US)
Fuel Pins
Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)
Hot Cells
Remote tool development at the interim examination and maintenance (IEM) cell, 12:16001 (J;US)

Loss of Flow
Application of the GEM shutdown device to the FFTF reactor, 12:16079 (J;US)
Reactivity worth of gas expansion modules (GEMs) in the fast flux test facility, 12:15861 (J;US)
Radioactive Waste Facilities
The Solid Waste Transfer Pit an FFTF [Fast Flux Test Facility] station for fuel and reflector transfer, 12:15983 (R;US)
Reactor Kinetics
Reactivity worth of gas expansion modules (GEMs) in the fast flux test facility, 12:15861 (J;US)
Reactor Operation
Reactor cover gas monitoring at the Fast Flux Test Facility, 12:15984 (R;US)
Reactor Safety Experiments
Application of the GEM shutdown device to the FFTF reactor, 12:16079 (J;US)
Reactor Shutdown
Application of the GEM shutdown device to the FFTF reactor, 12:16079 (J;US)

FIELD EMISSION MICROSCOPY
See ION MICROSCOPY

FIELD EQUATIONS
Numerical Solution
Optimization by a computational neural net, 12:17343 (R;US)

FIELD ION MICROSCOPY
See ION MICROSCOPY

FIELD THEORIES
See also GENERAL RELATIVITY THEORY
QUANTUM FIELD THEORY
Instantons
Instantons versus SUSY, 12:17165 (R;SU)
Supersymmetry
Instantons versus SUSY, 12:17165 (R;SU)

FILTERS
See also FABRIC FILTERS
OPTICAL FILTERS
Performance Testing
Hyperfiltration of tomato juice: pilot plant scale high temperature testing, 12:16853 (J;US)
Hyperfiltration of tomato juice during long term high temperature testing, 12:16854 (J;US)

FINANCIAL ASSISTANCE
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Radioactive waste management fellowship, 1985-1986, 12:15423 (R;US)

FINANCIAL MANAGMENT
See PROGRAM MANAGEMENT

FINLAND
Air Transport
Aviation Regulation OPS M1-18 on the Transport of Dangerous Goods by Air, 12:15576 (R;FI;In Finnish)
Liabilities
Decree bringing into force the Nuclear Liability Act (No. 486/72), 12:16058 (R;FI;In Finnish)
Nuclear Liability Act as amended (No. 484/72), 12:16057 (R;FI)
Maritime Transport
Decision of the National Board of Navigation on the Carriage of Dangerous Goods in Ships, 12:15575 (R;FI)
Non-Proliferation Policy
Ministerial Decision No. 116 on the export of some materials, equipment and devices in the field of Atomic Energy, 12:15574 (R;FI;In Finnish)
Nuclear Power Plants
Factors influencing capital costs of nuclear power plant in Finnish conditions, 12:15888 (RA;XA)
Nuclear Trade
Ministerial Decision No. 116 on the export of some materials, equipment and devices in the field of Atomic Energy, 12:15574 (R;FI;In Finnish)
Radiation Protection
Decision on radiation protection of 5.11.1968/594, 12:15571 (R;FI;In Finnish)
Radiation Protection Laws
Radiation Protection Act 26.4.1957/174, 12:15569 (R;FI;In Finnish)
Radiation Protection Decree 27.9.1957/328, 12:15570 (R;FI;In Finnish)
Radioactive Waste Processing
Council of State decision relating to examinations under Section 5 of the Radiation Protection Act (No. 243/58), 12:15573 (R;FI;In Finnish)
Radiological Personnel
Decree relating to the annual leave of persons working under harmful radiation conditions (No. 175/67), 12:15572 (R;FI;In Finnish)
Road Transport
Transport of dangerous substances by road, 12:15399 (R;FI;In Finnish)
Transport Regulations
Aviation Regulation OPS M1-18 on the Transport of Dangerous Goods by Air, 12:15576 (R;FI;In Finnish)
Decision of the National Board of Navigation on the Carriage of Dangerous Goods in Ships, 12:15575 (R;FI)
Transport of dangerous substances by road, 12:15399 (R;FI;In Finnish)

FINNISH ORGANIZATIONS
International Cooperation
Decree setting up the Atomic Energy Commission, as amended (No. 76/58), 12:17685 (R;FI;In Finnish)
Licensing
Decree relating to the competence of the National Board of Health to issue permits under the Radiation Protection Act, 5.2.1959/47, 12:17684 (R;FI;In Finnish)
Nuclear Energy
Decree setting up the Atomic Energy Commission, as amended (No. 76/58), 12:17685 (R;FI;In Finnish)
Nuclear Industry
Decree setting up the Atomic Energy Commission, as amended (No. 76/58), 12:17685 (R;FI;In Finnish)
Radiation Protection
Decree relating to the competence of the National Board of Health to issue permits under the Radiation Protection Act, 5.2.1959/47, 12:17684 (R;FI;In Finnish)

FIREDAMP
See METHANE

FIRES
Air Pollution
Atmospheric-dispersion index for prescribed burning. Forest Service research paper, 12:16728 (R;US)

FIRST WALL
Composite Materials
First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)
Design
First wall and vacuum vessel analysis for Compact Ignition Tokamaks, 12:17507 (J;US)
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Eddy Currents
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Evaporation
Improved understanding of first-wall vaporization-condensation in inertial confinement fusion reactors, 12:17564 (J;US)
Magnetohydrodynamics
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Materials Testing
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)

Mathematical Models
A model for first-wall thermal response to plasma energy deposition, 12:17517 (J;US)
Temperature Gradients
A model for first-wall thermal response to plasma energy deposition, 12:17517 (J;US)
Thermal Analysis
A model for first-wall thermal response to plasma energy deposition, 12:17517 (J;US)
Torque
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Vapor Condensation
Improved understanding of first-wall vaporization-condensation in inertial confinement fusion reactors, 12:17564 (J;US)

FISCHER-TROPSCH SYNTHESIS
Catalysts
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)

FISH MEAL
See FISH PRODUCTS

FISH PRODUCTS
Radicidation
Proposal for imported fish meal radicidation, 12:16852 (RA;CS;In Czech)

FISSION PRODUCT RELEASE
Coordinate with descriptors for the area of release such as BIOSPHERE or COOLANTS, and for the specific fission products, if known.
Downstream behavior of fission products, 12:15965 (R;US)
Calculation Methods
Calculations for determining appropriate key radionuclides for failed fuel analysis, 12:15827 (J;US)
Q Codes
QUASAR: a methodology for quantification of uncertainties in severe-accident source terms, 12:16102 (J;US)

FISSION PRODUCTS
Behavior
Downstream behavior of fission products, 12:15965 (R;US)
Correlations
Crystal structure stability and fission gas swelling in intermetallic uranium compounds, 12:16301 (J;NL)
Gamma Spectra
Modeling of Ge(Li) gamma-ray spectra, 12:16126 (J;US)
Reactor Safety Experiments
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)
Retention
Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)

FISSION RATIO
Data Covariances
Covariances for measured activation and fission ratios data, 12:17256 (R;US)

FISSION SPECTRA
Spectra Unfolding
Measurement of thermal-neutron-induced /sup 235/U fission spectrum by threshold detectors, 12:17255 (R;CN;In Chinese)
Uranium 235
Measurement of thermal-neutron-induced /sup 235/U fission spectrum by threshold detectors, 12:17255 (R;CN;In Chinese)

FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT

FIXATION (CARBON DIOXIDE)
See CARBON DIOXIDE FIXATION

FLAMES
Quantitative Chemical Analysis
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Raman Spectra
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)

FLAVOR MODEL
Configuration Mixing
Heavy flavour decays and the structure of weak interactions, 12:17132 (R;DE)

FLAWS
See DEFECTS

FLIBE
Molten salt of fluorine, lithium, and beryllium.
Chemical Reaction Kinetics
The chemistry of molten Li/sub 2/BeF/sub 4/, 12:17581 (J;US)
Corrosion Products
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Physical Radiation Effects
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Reliability
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)
Safety
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)

FLOW (FLUID)
See FLUID FLOW

FLOW MODELS
Hamiltonians
Hamiltonian differencing of fluid dynamics, 12:17093 (J;US)
Vortex Flow
CALTECH: DOE program on numerical analysis, computing and fundamental studies in fluid mechanics: Summary report No. 12, April 1, 1986-March 31, 1987, 12:17087 (R;US)

FLOWMETERS
Comparative Evaluations
Techniques for measurement of velocity in liquid-metal MHD flows, 12:17518 (J;US)
Design
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
Performance Testing
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)

FLUE GAS
Additives
Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)

FLUID FLOW
See also GAS FLOW
TURBULENT FLOW
TWO-PHASE FLOW
Computerized Simulation
On the use of CORLIB subroutines for the solution of a model fluid flow problem, 12:17655 (R;US)
F Codes
On the use of CORLIB subroutines for the solution of a model fluid flow problem, 12:17655 (R;US)
Numerical Solution
Super problems for supercomputers, 12:17681 (BA;US)
P Codes
Thermal-hydraulic aspects of flow inversion in a research reactor, 12:15982 (R;US)
Parallel Processing
Super problems for supercomputers, 12:17681 (BA;US)
Test Facilities
Fluidization mechanisms in slurry flows: Quarterly report, 12:16474 (R;US)

FLUID INJECTION
See also GAS INJECTION
STEAM INJECTION
WATERFLOODING
Rock-Fluid Interactions
1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid

composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)

FLUIDIZED-BED COMBUSTORS
Demonstration Programs
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Materials Testing
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)

FLUORINE 24
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)

FLUORINE COMPOUNDS
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)

FLUX (NEUTRON)
See NEUTRON FLUX

FLY ASH
Air Pollution
Performance of a high-sulfur-coal, pilot-scale fabric filter, 12:15747 (RA;US)
Biological Effects
Response of small laboratory animals to coal fly ash inhalation, 12:15344 (R;JP;In Japanese)
Chemical Properties
Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)
Deposition
Aerosol deposition in fabric filters, 12:15746 (RA;US)
Distribution of fly ash in a filter bag operating with a charged axial electrode, 12:15738 (RA;US)
Mutagen Screening
On the mutagenicity of fly ash samples from the PGEM power plant 'Gelderland' at Nijmegen, as determined with the Ames test, 12:15319 (R;NL;DU)
Physical Properties
Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)
Removal
Flue gas conditioning for improved baghouse performance, 12:15748 (RA;US)
Performance of a high-sulfur-coal, pilot-scale fabric filter, 12:15747 (RA;US)
Waste Product Utilization
Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)

FLYWHEEL ENERGY STORAGE
Efficiency
Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)
Optimization
Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)

FLYWHEELS
Design
Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)
Performance Testing
Fast-running permanent-magnet synchronous engine with small idle losses for kinetic energy storage systems, 12:16147 (R;DE;In German)

FOCUSSED LOGGING
See RESISTIVITY LOGGING

FOKKER-PLANCK COEFFICIENTS
See FOKKER-PLANCK EQUATION

FOKKER-PLANCK EQUATION
Numerical Solution
Approximation of Fokker-Planck equation by a deterministic particle method, 12:17399 (R;FR;In French)

FOOD
See also ANIMAL FEEDS
Irradiation
Application of ionizing radiation in food and feeds processing. Proceedings of seminar, 12:16844 (R;CS;In Czech)
Success and future potential of ionizing radiations in solving the food problem in the world, 12:16849 (RA;CS;In Czech)
Radiodisinfestation
Will radiodisinfestation lead to a reduction in pesticide residues in food?, 12:16850 (RA;CS;In Czech)
Radiopreservation
Expanding the possibilities of food and feeds irradiation using UVVVR radiation sources, 12:16851 (RA;CS;In Czech)

FOOD IRRADIATION
See FOOD PROCESSING

FOOD PROCESSING
Hazardous Materials
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)
Noise Pollution
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)

FOODSTUFFS
See FOOD

FORAMINIFERA
Isotope Dating
Structure and timing of the last deglaciation: oxygen-isotope evidence, 12:16922 (J;GB)

FORESTS
Acid Rain
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Air Pollution
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Harvesting
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Nutrients
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Remote Sensing
Changes in the area of forests in Rondonia, Amazon Basin, measured by satellite imagery, 12:16780 (BA;US)
Continental and global scale remote sensing of land cover, 12:16779 (BA;US)

FORMALDEHYDE
Air Pollution Monitoring
Aldehyde toxicity and load of immissions from motor vehicles, 12:16905 (R;DE;In German)
Carcinogenesis
Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
Metabolism
Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
Toxicity
Aldehyde toxicity and load of immissions from motor vehicles, 12:16905 (R;DE;In German)

FORMALIN
See FORMALDEHYDE

FORMALITH
See FORMALDEHYDE

FORMIC ALDEHYDE
See FORMALDEHYDE
FORMOL
See FORMALDEHYDE
FORMOSA
See TAIWAN
FORMYL RADICALS
Chemical Reaction Kinetics
The reaction of atomic hydrogen with the formyl radical, 12:16435 (BA;US)
FOSSIL FUEL RESERVES
See FOSSIL FUELS
FOSSIL FUELS
See also COAL
NATURAL GAS
OIL SANDS
OIL SHALES
PEAT
PETROLEUM
SHALE OIL
Combustion
Fossil fuel combustion: recent amounts, patterns, and trends in CO_2, 12:16757 (BA;US)
Possible changes in future use of fossil fuels to limit environmental effects, 12:16758 (BA;US)
Energy Consumption
Fossil fuels - reserves, consumption and environment, 12:16169 (RA;DE;In German)
Environmental Impacts
Fossil fuels - reserves, consumption and environment, 12:16169 (RA;DE;In German)
Joint Ventures
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:16168 (R;US)
Meetings
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:16168 (R;US)
Research Programs
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:16168 (R;US)
Reserves
Fossil fuels - reserves, consumption and environment, 12:16169 (RA;DE;In German)
FOSSIL-FUEL POWER PLANTS
Air Pollution Control
A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)
Air Pollution Monitoring
Plume washout and wet deposition of trace elements around the coal-fired power plant, 12:15318 (R;JP;In Japanese)
Blowers
Diagnostic monitoring of axial flow fan bearings, 12:15688 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Chemical Engineering
SCE experience (Southern California Edison), 12:15722 (RA;US)
Corrosion Protection
Water and steam chemistry control experiences with fossil peaking units, 12:15733 (RA;US)
Design
Adoption of water chemistry principles in fossil power plant design and operation (Federal Republic of Germany), 12:15728 (RA;US)
Economics
Cost of corrosion and scale in US utilities, 12:15709 (RA;US)
Feedwater
Phosphate and other hide-out, 12:15734 (RA;US)
Fly Ash
On the mutagenicity of fly ash samples from the PGEM power plant 'Gelderland' at Nijmegen, as determined with the Ames test, 12:15319 (R;NL;DU)
Fuel Substitution
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Maintenance
Benefits of switching from a manual to computerized vibration predictive maintenance system, 12:15683 (RA;US)
Materials
Adoption of water chemistry principles in fossil power plant design and operation (Federal Republic of Germany), 12:15728 (RA;US)
Mechanical Vibrations
Benefits of switching from a manual to computerized vibration predictive maintenance system, 12:15683 (RA;US)
Evaluation of alternative techniques for machinery vibration monitoring, 12:15684 (RA;US)
Operation
Adoption of water chemistry principles in fossil power plant design and operation (Federal Republic of Germany), 12:15728 (RA;US)
Pumps
Detection of incipient failure in vertical pumps, 12:15687 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Steam Generators
Acoustic leak detection in fossil fueled boilers, 12:15699 (RA;US)
Initial feasibility study of halogen tracer method for finding boiler tube leaks, 12:15703 (RA;US)
On-line boiler stress and condition analyzer, 12:15702 (RA;US)
Steam Turbines
Cost of corrosion and scale in US utilities, 12:15709 (RA;US)
Current developments in diagnostic monitoring, 12:15681 (RA;US)
Turbogenerators
Current developments in diagnostic monitoring, 12:15681 (RA;US)
On-line vibration monitoring at the United Illuminating Company, 12:15691 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Water Chemistry
Adoption of water chemistry principles in fossil power plant design and operation (Federal Republic of Germany), 12:15728 (RA;US)
Chemical analysis for fossil plant water chemistry, 12:15726 (RA;US)
Corrosion product transport in a cycling fossil plant, 12:15735 (RA;US)
Cycle chemistry: sampling points and frequencies, presentation, and use of analytical data, 12:15725 (RA;US)
EPRI fossil plant cycle chemistry programs, 12:15724 (RA;US)
Experience with water chemistry control in cycling units at Detroit Edison, 12:15732 (RA;US)
Fossil plant water chemistry - C.E.G.B. approach and experience, 12:15727 (RA;US)
Fossil plant water chemistry in Japan, 12:15729 (RA;US)
Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service, 12:15730 (RA;US)
Overview of RP2712-1, interim consensus guidelines on fossil plant cycle chemistry, 12:15720 (RA;US)
SCE experience (Southern California Edison), 12:15722 (RA;US)
Water and steam chemistry control experiences with fossil peaking units, 12:15733 (RA;US)
FOUR-BODY PROBLEM
Equations of Motion
Reduction of integral equations for four identical particles in the case of finite range forces, 12:17370 (R;SU;In Russian)
Finite-Range Interactions
Reduction of integral equations for four identical particles in the case of finite range forces, 12:17370 (R;SU;In Russian)
FOUR-PI COUNTING
Coincidence Methods
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)

Statistics
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)
FRACTOGRAPHY
Principal modes of rupture encountered in expertise of advanced components, 12:16245 (R;FR;In French)
FRAGMENTS (DECAY)
See DECAY
FRANCE
Nuclear Fuels
Possible short and long term evolution in the cost of PWRs nuclear fuel and coal, 12:15405 (RA;XA)
Nuclear Power Plants
Nuclear power and economics: keys to continuing progress, 12:15920 (J;US)
FRANCKENSTEIN
See SCANNING MEASURING PROJECTORS
FREE ELECTRON LASERS
Instability
Collective instability of a free electron laser including space charge and harmonics, 12:16468 (J;NL)
Performance
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
FREONS
Ecological Concentration
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
Environmental Effects
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
FRESH WATER
Environmental Transport
Continental shelf processes affecting the oceanography of the South Atlantic Bight: Progress report, June 1, 1986 to May 31, 1987, 12:16933 (R;US)
FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
FTR REACTOR (RICHLAND)
See FFTF REACTOR
FUEL ASSEMBLIES
See also FUEL ELEMENT CLUSTERS
Fluid Flow
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Testing
Performance of boiling water reactor fuel lead test assemblies to 35 MWd/kg U, 12:15780 (J;US)
FUEL ASSEMBLY DISMANTLING
Cutting Tools
German bundle shear - cold test results, 12:15390 (J;US)
FUEL BUNDLES
See FUEL ELEMENT CLUSTERS
FUEL CANS
Strains
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
FUEL CELL POWER PLANTS
For commercial, residential, or electric utility use.
Coal Gasification
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
Design
Design and economics of large fuel cell power plants, 12:16188 (R;US)
Desulfurization
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
FUEL CELLS
See also ACID ELECTROLYTE FUEL CELLS
HIGH-TEMPERATURE FUEL CELLS
Electric Conductivity
Characterization of monolithic fuel cell components, 12:16191 (R;US)
Electric Impedance
Characterization of monolithic fuel cell components, 12:16191 (R;US)
Reviews
High-temperature fuel cells, 12:16192 (R;US)
FUEL CONSUMPTION
Sectoral Analysis
Possibilities of longterm improvement of the structure of the energy supply in West Germany. Summary, 12:16153 (R;DE;In German)
FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE
FUEL CYCLE
Cost
Effect of changes in DOE pricing policies for enrichment and reprocessing on research reactor fuel cycle costs, 12:15869 (R;US)
F Codes
Nuclear fuel cycle variables calculation code - FUTURE, 12:15908 (J;US)
Planning
Nuclear fuel cycle variables calculation code - FUTURE, 12:15908 (J;US)
Systems Analysis
Application of systems engineering to fuel processing activities, 12:15911 (J;US)
FUEL ELEMENT CLUSTERS
Seismic Effects
Transverse vibration of beam with beats, induced by seismic excitation, 12:16043 (RA;CS;In Czech)
FUEL ELEMENTS
See also FUEL PINS
FUEL RODS
SPENT FUEL ELEMENTS
Computerized Simulation
A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Water reactor fuel element performance computer modelling, 12:15796 (B;US)
Criticality
Criticality safety evaluation for pathfinder fuel elements in model No. RA-3 shipping containers, 12:15398 (R;US)
Damage
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Design
O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)
Preliminary LEU fuel cycle analyses for the Belgian BR2 reactor, 12:15981 (R;US)
Fission Product Release
A model for fission product distribution in CANDU fuel, 12:16146 (BA;US)
Lifetime
Factors controlling metal fuel lifetime, 12:15850 (R;US)
Performance
Factors controlling metal fuel lifetime, 12:15850 (R;US)
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Steady-sate and load-follow characteristics of various BWR fuel designs, 12:15783 (J;US)
Solid Solutions
O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)
Testing
Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements, 12:15848 (R;US)
Transport
Criticality safety evaluation for pathfinder fuel elements in model No. RA-3 shipping containers, 12:15398 (R;US)
FUEL FABRICATION PLANTS
Decommissioning
Research reactor and fuel development/production facility decommissioning technology and experience, 12:16067 (J;US)
FUEL GAS
See also NATURAL GAS

Hot Gas Cleanup
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)

FUEL MANAGEMENT
Optimization
Examination of fuel reinsertion strategies for out-of core fuel management, 12:15907 (J;US)
Integral fuel burnable absorber experience in two- and three-loop cores, 12:15956 (J;US)
Planning
Examination of fuel reinsertion strategies for out-of core fuel management, 12:15907 (J;US)

FUEL MOTION DETECTION
Reactor Safety Experiments
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)

FUEL PELLETS
Corrosion Resistance
In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)

FUEL PENCILS
See FUEL PINS

FUEL PINS
Fission Products
Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)
Performance
Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
S Codes
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Thermal Expansion
Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)
Weight Indicators
Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)

FUEL RACKS
Seismic Effects
Seismic behavior of spent-fuel racks supported by aseismic bearing devices, 12:15403 (J;US)

FUEL REPROCESSING
See REPROCESSING

FUEL REPROCESSING PLANTS
See also IDAHO CHEMICAL PROCESSING PLANT
WEST VALLEY PROCESSING PLANT
Hot canyon crane operating problems and equipment failures: F-Canyon Reprocessing Facility, Savannah River Plant, 12:15386 (R;US)
Construction Permits
Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian Ministry of State for Regional Development and Environmental Affairs, 12:15388 (R;DE;In German)
Doors
Close-fitting shield doors with sculptured edges, 12:15391 (J;US)
Fuel Assembly Dismantling
German bundle shear - cold test results, 12:15390 (J;US)
Licensing
Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian Ministry of State for Regional Development and Environmental Affairs, 12:15388 (R;DE;In German)
Modifications
CEA R and D contribution to the La Hague extension plant (fuel reprocessing), 12:15379 (R;FR)
Marcoule pilot plant (Nuclear fuel reprocessing), 12:15380 (R;FR)
Public Relations
Preliminary statement concerning the expert opinion and other documents relating to the Wackersdorf fuel reprocessing plant, laid open between June 18 and July 15, 1985 by the Bavarian Ministry of State for Regional Development and Environmental Affairs, 12:15388 (R;DE;In German)
Radiation Protection
Close-fitting shield doors with sculptured edges, 12:15391 (J;US)
Remote Handling Equipment
Aspects of remote maintenance in an FRG reprocessing plant from the manufacturer's viewpoint, 12:15396 (J;US)
Design and testing of remote handling systems for reprocessing plant maintenance and for nuclear reactor dismantling, 12:15394 (J;US)
Remote maintenance in the TOR fast reactor fuel reprocessing facility, 12:15395 (J;US)

FUEL ROD CONSOLIDATION
See FUEL RODS

FUEL RODS
Burnup
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Computerized Simulation
Effect of axial diffusional delays on the overall fission gas release, 12:15972 (BA;US)
Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
Fission Product Release
Effect of axial diffusional delays on the overall fission gas release, 12:15972 (BA;US)
Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
P Codes
Development of a PCMI analysis code for the Fugen MOX fuel rod, 12:15845 (BA;US)
Performance
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Rewetting
Quenching rates in 7-rod bundle of zirconium alloy at emergency cooling parameters of WWER, 12:16032 (R;SU;In Russian)
S Codes
SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
Thermal Diffusion
Effect of axial diffusional delays on the overall fission gas release, 12:15972 (BA;US)

FUEL SHEATHS
See FUEL CANS

FUEL SLUGS
See FUEL RODS

FUEL SLURRIES
Acoustic Measurements
Advanced research in instrumentation and control technology: Acoustic parameter studies, 12:16599 (R;US)
Atomization
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Chemical Preparation
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)

Combustion Kinetics
A comparison of the evolution of particle size distributions during combustion for coal and coal/water slurries, 12:15333 (BA;US)
Quantitative Chemical Analysis
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)

FUEL SUSPENSIONS
See FUEL SLURRIES

FUELS
See also AUTOMOTIVE FUELS
FOSSIL FUELS
FUEL SLURRIES
LIQUID FUELS
NUCLEAR FUELS
REFUSE DERIVED FUELS
SOLID FUELS
SYNTHETIC FUELS
THERMONUCLEAR FUELS
Combustion Products
Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)
Raman Spectra
Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)

FUELS (NUCLEAR)
See NUCLEAR FUELS

FULLERS EARTH
Sorptive Properties
Study of high temperature removal of alkali of a pressurized gasification system: Final report (Emathlite pellets), 12:15276 (R;US)

FUMES
See AEROSOLS

FUNDAMENTAL PARTICLES
See ELEMENTARY PARTICLES

FURNACES
See also BLAST FURNACES
Energy Demand
Energy optimisation of industrial furnaces by optimum control, 12:16500 (R;DE;In German)
Optimization
Energy optimisation of industrial furnaces by optimum control, 12:16500 (R;DE;In German)

FUSED SALTS
See MOLTEN SALTS

FUSION ELECTROMAGNETIC INDUCTION EXPERIME
See FELIX FACILITY

FUSION ENERGY
See THERMONUCLEAR REACTORS

FUSION FUELS
See THERMONUCLEAR FUELS

FUSION (NUCLEAR)
See THERMONUCLEAR REACTIONS

FUSION REACTIONS
See HEAVY ION FUSION REACTIONS

FUSION REACTORS
See THERMONUCLEAR REACTORS

G

G CODES
Upgrade of the GRESS (test version D) precompiler to allow triply-dimensioned arrays, 12:17654 (R;US)

GADOLINIUM
Activation Analysis
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

GADOLINIUM 163
Cross Sections
Nuclear data for gadolinium production, 12:15578 (J;US)
Nuclear Data Collections
Nuclear data for gadolinium production, 12:15578 (J;US)
Production
Nuclear data for gadolinium production, 12:15578 (J;US)

GADOLINIUM OXIDES
Solid Solutions
O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)

GALAXIES
Cosmological Models
Two states of CYG X-1 and related sources, 12:17038 (R;US)
Emission Spectra
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)
Neutrinos
Neutrino masses and galaxy formation, 12:16953 (RA;CS)
Star Evolution
Early galactic evolution and the nature of the first stars, 12:17049 (R;DK)

GALAXY CLUSTERS
Correlation Functions
Correlation functions for the clustering of galaxies and Abell clusters, 12:17045 (R;DK)

GALAXY NUCLEI
Central part of galaxies.
Polarization
Frequency dependent polarization in blazars, 12:17043 (R;DK)

GALLIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)

GALLIUM 71 TARGET
Neutrino Reactions
Solar neutrino experiments, 12:17106 (RA;CS)

GALLIUM ARSENIDES
Electronic Structure
The surface electronic structure of GaAs(100) and GaAs(111) from angle resolved photoemission, 12:16373 (BA;US)
Molecular Beam Epitaxy
Superlattice structures grown by molecular beam epitaxy, 12:16371 (BA;US)
Photoemission
The surface electronic structure of GaAs(100) and GaAs(111) from angle resolved photoemission, 12:16373 (BA;US)
Superlattices
Superlattice structures grown by molecular beam epitaxy, 12:16371 (BA;US)
Surface Properties
The surface electronic structure of GaAs(100) and GaAs(111) from angle resolved photoemission, 12:16373 (BA;US)

GAMMA DETECTION
Coincidence Methods
Method of processing data and evaluating uncertainty in $4\pi\beta$-γ coincidence measurement, 12:16597 (R;CN;In Chinese)

GAMMA HEATING
See RADIATION HEATING

GAMMA LOGGING
Well Logging Equipment
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)

GAMMA RADIATION
See also PROMPT GAMMA RADIATION
Radiation Transport
SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)

GAMMA REACTIONS
See PHOTONUCLEAR REACTIONS

GAMMA SOURCES
For cosmic sources of gamma radiation use COSMIC GAMMA SOURCES.
Construction
Multipurpose prompt gamma facility, 12:15581 (J;US)
Design
Multipurpose prompt gamma facility, 12:15581 (J;US)

GAMMA SPECTRA
S Codes
Modeling of Ge(Li) gamma-ray spectra, 12:16126 (J;US)

GAMMA SPECTROMETERS
Natural Radioactivity
Radioactive contaminations of materials for low-background setups, 12:16643 (R;SU;In Russian)
On-Line Measurement Systems
Automation correlation installation on-line with a computer, 12:16642 (R;SU;In Russian)
Subsurface Structures
Investigation of backgrounds of scintillation and semiconductor detectors in the underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences, 12:16644 (R;SU;In Russian)
GAMMA-RAY LASERS
See GASERS
GANIL
See GANIL CYCLOTRON
GANIL CYCLOTRON
Grand Accelerateur National 'a Ions Lourdes, a heavy ion accelerator consisting of two identical isochronous cyclotrons and a particle booster for injection, located in Orsay, France.
Irradiation Devices
Interaction of GeV heavy ions with solids-first results at GANIL, 12:16536 (R;FR)
GARNETS
For silicate garnets only.
Photoconductivity
Ground and excited state photoconductivity measurements of Ce^{3+}:YAG, 12:16352 (R;US)
GAS COOLANTS
See GASES
GAS ENGINES
See INTERNAL COMBUSTION ENGINES
GAS FLOW
Equations of Motion
On the Maxwellian distribution, symmetric form, and entropy conservation for the Euler equations, 12:16476 (R;US)
GAS INJECTION
Bench-Scale Experiments
Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)
Sweep Efficiency
Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)
GAS LASERS
See also CARBON DIOXIDE LASERS
Nuclear Pumping
Nuclear reactor excitation of XeF laser gas mixtures, 12:16467 (R;US)
GAS TURBINE ENGINES
Turbine Blades
Slow crack growth in sintered silicon nitride, 12:16339 (BA;US)
GAS TURBINE POWER PLANTS
Materials
Materials for large land-based gas turbines. Final report, 1984-1986, 12:15737 (R;US)
GAS YIELDS
Expansion of high-temperature; high-pressure data set for coal gasification: Sixth quarterly report, December 28, 1985-March 28, 1986, 12:15280 (R;US)
GASERS
Gamma-ray Amplification by Stimulated Emission of Radiation.
Photonuclear Reactions
Nuclear interlevel transfer driven by collective outer shell electron oscillations, 12:17351 (R;US)
GASES
See also AIR
EXHAUST GASES
FUEL GAS
RARE GASES
SYNTHESIS GAS
VOLCANIC GASES
Diffusion
Micropore diffusion in coal chars under reactive conditions: Quarterly technical progress report, 15 September 1986-15 December 1986, 12:15287 (R;US)
Ion Collisions
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
GASOLINE ENGINES
See INTERNAL COMBUSTION ENGINES
GE SEMICONDUCTOR DETECTORS
See also HIGH-PURITY GE DETECTORS
LI-DRIFTED GE DETECTORS
Performance
Using a HPGe detector and micro R meter for quick and simple estimate of radionuclide activity in LSA shipping containers, 12:15531 (RA;US)
GE(LD) DETECTORS
See LI-DRIFTED GE DETECTORS
GENERAL CIRCULATION MODELS
Sensitivity
General circulation model CO_2 sensitivity experiments: snow-sea ice albedo parameterizations and globally averaged surface air temperature, 12:16738 (J;NL)
Validation
January and July simulations with a spectral general circulation model, 12:16699 (J;US)
GENERAL RELATIVITY THEORY
See also RELATIVITY THEORY
Einstein's Prague ideas on gravitation: the history and the present, 12:17363 (RA;CS)
Asymptotic Solutions
Asymptotic behaviour of Robinson-Trautman pure radiation solutions, 12:17385 (R;HU)
Kerr Metric
On the types of unbounded orbits in Kerr metric, 12:17365 (R;SU;In Russian)
GENERATORS (ELECTRIC)
See ELECTRIC GENERATORS
GENERATORS (PULSE)
See PULSE GENERATORS
GENERATORS (STEAM)
See STEAM GENERATORS
GENTILLY REACTOR
Nicolet, Quebec, Canada
Decommissioning
Establishing a comprehensive cost-effective radiological protection program for decommissioning project, 12:16009 (RA;US)
Personnel Monitoring
Evaluation of use of the NNC Gamma-12 portal monitor for internal dosimetry screening during decommissioning, 12:16012 (RA;US)
GEOLOGIC DEPOSITS
See also NATURAL GAS DEPOSITS
OIL SAND DEPOSITS
PETROLEUM DEPOSITS
SALT DEPOSITS
Radioactive Waste Disposal
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project, 12:15421 (R;US)
GEOLOGIC FRACTURES
Fluid Flow
Coupled processes in single fractures, double fractures and fractured porous media, 12:16919 (R;US)
Radionuclide Migration
Coupled processes in single fractures, double fractures and fractured porous media, 12:16919 (R;US)
GEOMAGNETIC STORMS
See MAGNETIC STORMS
GEORGIA
Coastal Waters
Sediment transport characteristics of the nearshore zone between Hilton Head and Ossabaw Islands, Georgia as determined by heavy mineral analysis, 12:16934 (R;US)
GEOTHERMAL RESOURCES
Resource Assessment
Further investigations of the UK heat flow field (1981-1984). Investigation of the geothermal potential of the UK, 12:15628 (R;GB)
GEOTHERMAL SPRINGS
See THERMAL SPRINGS
GEOTHERMAL SYSTEMS
See also HOT-DRY-ROCK SYSTEMS

MAGMA SYSTEMS
Geology
Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada, 12:15627 (J;US)
Hydrology
Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada, 12:15627 (J;US)

GERMAN FEDERAL REPUBLIC
See FEDERAL REPUBLIC OF GERMANY

GERMANIUM
Grain Boundaries
Ab-initio determination of the structure of a grain boundary by simulated quenching, 12:16354 (R;US)
Theoretical investigation of twist boundaries in germanium, 12:16266 (R;US)
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Physical Radiation Effects
Time-resolved x-ray studies during pulsed-laser irradiation of Ge, 12:16306 (J;US)
Sorptive Properties
Adsorption of Ag on Ge(100)-(2 x 1), 12:16315 (J;GB)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)

GERMANIUM 68
Adsorption
Studies of the chemical behavior of carrier-free /sup 68/Ge. Pt. 3. Adsorptive properties, 12:16432 (J;DE)

GERMANIUM 76
Double Beta Decay
Results of underground experiment of neutrinoless double beta-decay of /sup 76/Ge, 12:17226 (R;SU;In Russian)
Half-Life
Results of underground experiment of neutrinoless double beta-decay of /sup 76/Ge, 12:17226 (R;SU;In Russian)

GERMANIUM COMPOUNDS
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)

GERMANIUM DETECTORS
See GE SEMICONDUCTOR DETECTORS

GERMANY (FEDERAL REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY

GES FUER REAKTORSICHERHEIT
A section of the Technical Inspection Associations of the German Federal Republic
Research Programs
GRS annual report 1985, 12:17635 (R;DE;In German)

GIANT RESONANCE
Collective Excitations
Closer of the chain of kinetic equation moments and description of the negative-parity collective excitations, 12:17295 (R;SU;In Russian)
Quadrupole Moments
Isoscalar quadratic energy weighted sum rules and quadrupole moment of giant quadrupole resonance, 12:17285 (R;JP)
Random Phase Approximation
Random phase approximation, 12:17286 (R;FR)

GIANT RESONANCE MODEL
Isospin
Isospin mixing during the decay of the Giant Dipole Resonance, 12:17274 (RA;CS)

GIANT STARS
Absorption Spectra
Chromospheric activity of cool giant stars. Final report, 12:17030 (R;US)

GLACIERS
Age Estimation
Structure and timing of the last deglaciation: oxygen-isotope evidence, 12:16922 (J;GB)
Melting
Structure and timing of the last deglaciation: oxygen-isotope evidence, 12:16922 (J;GB)

GLASS
See also BOROSILICATE GLASS
Erosion
Erosion damage in glass and alumina, 12:16330 (R;US)
Fracture Properties
Effect of surface corrosion on glass fracture, 12:16365 (BA;US)
Leaching
Waste glass leaching: Chemistry and kinetics, 12:15448 (R;US)
Stress Corrosion
Effect of surface corrosion on glass fracture, 12:16365 (BA;US)

GLASS INDUSTRY
Electric Power
The role of electricity in glass making, 12:16217 (R;US)

GLASS MELTERS
See CERAMIC MELTERS

GLASSY METALS
See METALLIC GLASSES

GLOVEBOXES
Computer-Aided Design
Computer-aided design of glove boxes and enclosures, 12:16447 (J;US)
Decontamination
Use of urethane foam in the decontamination and decommissioning of nuclear facilities, 12:15519 (RA;US)
Welded Joints
Evaluation of glovebox sectioning using weld splitting techniques, 12:16458 (J;US)

GLUEBALLS
Particle Production
Experiment to study the gluon interactions and glueball production in the central region of hadron collisions at UNK energies (2-3 TEV), 12:17103 (R;SU)

GLUONIUM
See GLUEBALLS

GLUONS
Jet Model
Properties of gluon jets, 12:17095 (R;US)
Structure Functions
QCD and hard quark and gluon scattering, 12:17138 (RA;CS)
Vacuum States
Approach to calculation of the infrared region contribution to vacuum expectation values of gluonic and quark fields, 12:17163 (R;SU)

GLYCOSYL HYDROLASES
Code number 3.2.
Enzyme Activity
Levels of uracil DNA glycosylase and AP endonuclease in murine B- and T-lymphocytes do not change with age, 12:16798 (J;CH)

GOATS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)

GOBAR GAS
See METHANE

GOLD
Diffusion
Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
Grain Boundaries
Lattice imaging study of grain boundaries at normal incidence to the boundary plane, 12:16267 (R;US)
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Surface Coating
Magnetic properties of novel epitaxial films, 12:16254 (R;US)

Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)
GOLD 197 TARGET
Argon 40 Reactions
Multiplicity dependent light particle correlations in $^{40}Ar + ^{197}Au$ reaction at E/A = 60 MeV^0, 12:17236 (R;FR)
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
Two-particle correlations in $^{40}Ar + ^{197}Au$ at 60 MeV/A, 12:17234 (R;FR)
Carbon 12 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
GOLD IODIDES
Crystal Lattices
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_2^-, I_3^-), 12:16412 (J;US)
Electron-Phonon Coupling
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_2^-, I_3^-), 12:16412 (J;US)
Transition Temperature
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_2^-, I_3^-), 12:16412 (J;US)
GOLD IONS
Energy-Level Transitions
Ionization model for nickel-like gold, 12:16464 (R;FR)
Population model for nickel-like gold which transitions to discard, 12:17060 (R;FR)
Population Inversion
Population model for nickel-like gold which transitions to discard, 12:17060 (R;FR)
GOLD ISOTOPES
Argon 40 Reactions
Search for impact parameter dependence of two-particle correlations using exclusive observables in nucleus-nucleus collisions at intermediate energies, 12:17219 (R;FR)
Rotational States
High-spin states and coexisting states in the Pt-Au transition region, 12:17235 (R;US)
GOLDHABER-TELLER MODEL
See GIANT RESONANCE MODEL
GRADED BAND GAP SOLAR CELLS
See CASCADE SOLAR CELLS
GRAIN ALCOHOL
See ETHANOL
GRAIN BOUNDARIES
Computerized Simulation
Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
Oxidation
Grain boundary oxidation and fatigue crack growth at elevated temperatures. Final report, 12:16287 (R;US)
GRAND GULF-1 REACTOR
Port Gibson, Mississippi, USA
Reactor Core Disruption
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Summary of core damage frequency from internal initiators: Grand Gulf, 12:16084 (J;US)
Risk Assessment
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Smart approach to level-1 probabilistic risk assessment, 12:16080 (J;US)
Summary of core damage frequency from internal initiators: Grand Gulf, 12:16084 (J;US)
GRAND UNIFIED THEORY
Cosmology
Astrophysics and grand- and superunification, 12:16954 (RA;CS)
CP Invariance
Problems of CP-violation in early unification theories, 12:17162 (R;SU)
Fermions
Fermion masses in GUTs with intermediate scales, 12:17188 (BA;NL)
P Invariance
Problems of CP-violation in early unification theories, 12:17162 (R;SU)
Particle Multiplets
Problem of families, 12:17187 (BA;NL)
Supersymmetry
Towards a theory of fermion masses: A two-loop finite ν=1global SUSY GUT, 12:17395 (BA;US)
Symmetry Breaking
Problems of CP-violation in early unification theories, 12:17162 (R;SU)
GRANITES
Activation Analysis
Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)
GRAPHITE
Atom Collisions
Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
Evaporation
Formation of long carbon chain molecules during laser vaporization of graphite, 12:16424 (J;US)
Phase Studies
Formation of long carbon chain molecules during laser vaporization of graphite, 12:16424 (J;US)
Physical Radiation Effects
First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)
Sorptive Properties
Heat capacities of rare gases adsorbed on graphite. Technical report, 12:16345 (R;US)
GRAPHITE FIBERS
See CARBON FIBERS
GRAPHITE MODERATOR
See GRAPHITE
GRASERS
See GASERS
GRAVIMELT PROCESS
Bench-Scale Experiments
Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985, 12:15282 (R;US)
Chemical Reactors
Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985, 12:15282 (R;US)
Reagents
Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985, 12:15282 (R;US)
GRAVITATION
Baryon Number
Comment to the reanalysis of the Eoetvoes experiment, 12:17382 (R;HU)
Field Equations
Gravitation and vacuum field, 12:17359 (R;SU;In Russian)
GRAVITATIONAL COLLAPSE
Minkowski Space
Gravitational collapse in relativistic theory of gravitation, 12:17362 (R;SU;In Russian)

GRAVITATIONAL WAVE DETECTORS
Design
Parametric transformation of weak gravitational wave into electromagnetic one in a three-level system, 12:16959 (RA;SU;In Russian)
GRAVITATIONAL WAVES
Parametric transformation of weak gravitational wave into electromagnetic one in a three-level system, 12:16959 (RA;SU;In Russian)
Topology
Gravitational waves with topological charge, 12:17377 (RA;SU;In Russian)
Wave Equations
Gravitational waves with topological charge, 12:17377 (RA;SU;In Russian)
GREAT BRITAIN
See UNITED KINGDOM
GREEN OIL
See SHALE OIL FRACTIONS
GRENOBLE REACTOR MELUSINE-2
See SILOETTE REACTOR
GROSSWELZHEIM HDR REACTOR
See HDR REACTOR
GROUND SUBSIDENCE
Regulations
Regulation of surface subsidence in West Virginia, 12:15346 (BA;US)
GROUND WATER
Chemical Reactions
The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
Flow Models
Effect of percolation rate on water-travel time in deep, partially saturated zones, 12:15438 (RA;US)
Fluid flow in a fractured rock mass, 12:15437 (RA;US)
Radiolysis
Effects of gamma radiolysis on waste package components, 12:16263 (R;US)
Water Chemistry
The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
Water Pollution Abatement
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
GROWTH
See also PLANT GROWTH
Inhibition
Factors affecting growth inhibition of enteric bacteria by methyl α-D-glucoside, 12:16836 (RA;US)
GROWTH INHIBITION
See GROWTH
GROWTH STIMULATION
See GROWTH
GRS
See GES FUER REAKTORSICHERHEIT
GUARD LOGGING
See RESISTIVITY LOGGING
GUINEA PIGS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)

H

H CODES
Evaluation and status report on HYDROCOIN at midway (HYDROCOIN: An international project for studying groundwater hydrology modelling strategies), 12:16920 (R;US)
HADRON-HADRON INTERACTIONS
Bag Model
Phenomenologic consideration of quark degrees of freedom in potential description approach, 12:17288 (R;SU)
Hard Collision Models
QCD and hard quark and gluon scattering, 12:17138 (RA;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
HADRONS
Spectroscopy
Hadron spectroscopy using Monte Carlo technique in lattice gauge theory, 12:17141 (RA;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
HAFNIUM COMPOUNDS
See also HAFNIUM OXIDES
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
HAFNIUM OXIDES
Fracture Properties
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Metallurgical Effects
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
HALF-LIFE (BIOLOGICAL)
See BIOLOGICAL HALF-LIFE
HALF-LIFE (EFFECTIVE)
See BIOLOGICAL HALF-LIFE
HALIDES
See also BROMIDES
CHLORIDES
IODIDES
Chemical Reactions
Facile reductive cleavage of the C=O bond of acyl halides and the C identical with N bond of nitriles by hydrogen in the presence of sulfido-bridged molybdenum complexes, 12:16415 (J;US)
HALL GENERATORS
See MHD GENERATORS
HALLEY COMET
Heavy Ions
Observations of heavy energetic ions for upstream from comet Halley, 12:16966 (R;US)
Mathematical Models
Icy-glue model of cometary nuclei, 12:16960 (R;HU)
HAMILTON OPERATORS
See HAMILTONIANS
HAMILTONIANS
What underlies the Anderson Hamiltonian, 12:17357 (R;US)
HAMSTERS
Biological Stress
Response of small laboratory animals to coal fly ash inhalation, 12:15344 (R;JP;In Japanese)
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
HANDLING (DATA)
See DATA PROCESSING
HANDLING (WASTES)
See WASTE MANAGEMENT

HANFORD PRODUCTION REACTORS
Decommissioning
Decommissioning planning and the assessment of alternatives for the Hanford production reactors, 12:15502 (RA;US)
HANFORD RESERVATION
Historical Aspects
Hanford defense mission: Past, present and future, 12:17631 (R;US)
HARD COAL
See ANTHRACITE
HARMONIC OSCILLATORS
Feynman Path Integral
Approximate calculation of the conditional Winer integral in quantum mechanics problems. Harmonic oscillator, 12:17380 (R;SU;In Russian)
HARRIS-1 REACTOR
Specifications
Technical specifications (Docket No. 50-400): Appendix "A" to License No. NPF-63, 12:15804 (R;US)
HASTELLOY C-276
See HASTELLOYS
HASTELLOY C-4
See HASTELLOYS
HASTELLOYS
Corrosion
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
HAWAII
Air Pollution
Atmospheric CO_2 concentrations Mauna Loa Observatory, Hawaii 1958-1983, 12:16708 (R;US)
Wind Power
Progress and problems in wind energy research and development in Hawaii, 12:15647 (BA;US)
HAZARDOUS MATERIALS
Not for radioactive materials.
Air Pollution
Locating and estimating air emissions from sources of ethylene oxide, 12:16724 (R;US)
Biological Accumulation
Environmental biomonitoring with feral rodent species (Peromyscus leucopus), 12:16900 (RA;US)
Dusts
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)
Evaluation
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Genetic Effects
Environmental biomonitoring with feral rodent species (Peromyscus leucopus), 12:16900 (RA;US)
Indoor Air Pollution
Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon (2-ethoxyethanol), 12:16713 (R;US)
Land Pollution Control
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
Risk Assessment
Hazard waste risk assessment, 12:15444 (RA;US)
Soil Chemistry
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
Vinyl Chloride
Vinyl chloride standards: responses to comments on January 1985 proposed revisions, 12:16771 (R;US)
Waste Management
Hazardous-waste management: a descriptive study. Master's thesis, 12:16156 (R;US)
Waste Processing
Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)
HCDA
See REACTOR CORE DISRUPTION
HD 8077
See NICKEL BASE ALLOYS
HDO
See HEAVY WATER
HDR REACTOR
Reactor Safety Experiments
HDR [Heissdampfreaktor] Phase 2 vibrational experiments, 12:16020 (R;US)
HEALTH PHYSICS
See RADIATION PROTECTION
HEART
Radioisotope Scanning
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
HEART DISEASE
See CARDIOVASCULAR DISEASES
HEAT DISSIPATION
See DIFFUSION
HEAT TRANSFER
HEAT EXCHANGERS
Heat Transfer
Validation of an intermediate heat exchanger model for real-time analysis, 12:15859 (J;US)
HEAT TRANSFER
See also CONVECTION
Calculation Methods
Time-dependent nodal integral methods in linear and nonlinear heat conduction, 12:16479 (J;US)
Computer Calculations
PC-class microcomputer experience in radiation protection and shielding analysis at INEL, 12:16448 (J;US)
Computerized Simulation
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Modeling of drift effects in CANDU reactors, 12:15844 (J;US)
Information Needs
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Navier-Stokes Equations
Discussion of the numerical stability of an improved upwinding scheme, 12:16481 (J;US)
Time Dependence
Time-dependent nodal integral methods in linear and nonlinear heat conduction, 12:16479 (J;US)
HEAT TRANSMISSION
See HEAT TRANSFER
HEATERS
See also FEEDWATER HEATERS
Corrosion
Impact of feedwater chemistry on feedwater heater tubes, 12:15715 (RA;US)
HEAVY ION ACCELERATORS
Includes combined accelerator types for heavy ion acceleration.
See also ATLAS SUPERCONDUCTING LINAC
GANIL CYCLOTRON
HILACS
Performance
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Storage Rings
Design considerations for a combined synchrotron-light source and heavy-ion storage ring Atomic Physics Facility, 12:16533 (R;US)
The Heidelberg test storage ring for heavy ions and its use for atomic physics, 12:16591 (R;US)
Synchrotron Radiation Sources
Design considerations for a combined synchrotron-light source and heavy-ion storage ring Atomic Physics Facility, 12:16533 (R;US)

HEAVY ION FUSION REACTIONS
Feasibility Studies
Heavy-ion fusion: Setting the stage, 12:17615 (J;US)
Nuclear Reaction Kinetics
Fusion with projectiles form carbon to argon at energies between 20A and 60A MeV, 12:17243 (R;FR)
Reviews
Heavy-ion fusion: Setting the stage, 12:17615 (J;US)
Tunnel Effect
Sub-barrier fusion, 12:17261 (R;DE)
HEAVY ION LINEAR ACCELERATORS
See HILACS
HEAVY ION REACTIONS
See also ARGON 40 REACTIONS
CALCIUM 48 REACTIONS
CARBON 12 REACTIONS
MAGNESIUM 24 REACTIONS
NEON 20 REACTIONS
NICKEL 58 REACTIONS
OXYGEN 16 REACTIONS
SILICON 28 REACTIONS
SULFUR 32 REACTIONS
Heavy ion collisions, the quark-gluon plasma and antinucleon annihilation, 12:17125 (R;IN)
GeV Range 01-10
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
Meetings
Report of the joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators (II), 12:17200 (R;JP)
MeV Range 100-1000
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
Precompound-Nucleus Emission
Walkers, slaves or both?, 12:17275 (RA;CS)
HEAVY NUCLEI
For nuclei from mass 181 upwards.
See also LEAD 210
LEAD 212
POLONIUM 210
RADIUM 224
RADIUM 226
RADIUM 227
RADON 222
Decay
Particle emission but also fission in the decay of very excited nuclei, 12:17260 (R;FR)
Excited States
Particle emission but also fission in the decay of very excited nuclei, 12:17260 (R;FR)
Fast Fission
Particle emission but also fission in the decay of very excited nuclei, 12:17260 (R;FR)
HEAVY OILS
See PETROLEUM
HEAVY WATER
Desorption
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Physical Radiation Effects
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
HEAVY WATER COOLANT
See HEAVY WATER
HEAVY WATER MODERATED REACTORS
See also CANDU TYPE REACTORS
PHWR TYPE REACTORS
VENUS REACTOR
Fuel Rods
Development of a PCMI analysis code for the Fugen MOX fuel rod, 12:15845 (BA;US)
HEAVY WATER MODERATOR
See HEAVY WATER
HEISSDAMPFREAKTORANLAGE
See HDR REACTOR
HELIUM
Cryopumps
Pool type liquid helium cryopump, 12:16439 (R;IN)
Tritium Recovery
A process to recover tritium from high pressure helium, 12:17612 (J;US)
HELIUM 3 A
Vortex Flow
Quantized vortices in rotating superfluid /sup 3/He, 12:17092 (RA;CS)
HELIUM 3 B
Vortex Flow
Quantized vortices in rotating superfluid /sup 3/He, 12:17092 (RA;CS)
HELIUM 3 TARGET
Neutron Reactions
Nuclear reactor excitation of XeF laser gas mixtures, 12:16467 (R;US)
Standardization
Advances in the use of ^{3}He in gas scintillation counters, 12:16669 (J;US)
HELIUM 4 REACTIONS
See ALPHA REACTIONS
HETEROGENEOUS REACTOR CORES
Heterogeneous Effects
Monte Carlo narrow resonance calculational techniques for treating double-heterogeneity effects, 12:15858 (J;US)
HIGGS BOSONS
Hadronic Particle Decay
Once again about the role of gluonic mechanism in interaction of light Higgs boson with hadrons, 12:17144 (R;SU)
Particle Decay
Heavy flavors, 12:17155 (R;US)
Particle Production
Higgs boson production by W and Z collisions, 12:17153 (R;FR)
On the question of Higgs boson production in heavy quarkonium decays, 12:17129 (R;SU)
HIGH ALTITUDE (STRATOSPHERE)
See STRATOSPHERE
HIGH ENERGY PHYSICS
Use only for articles of a very broad nature such as an annual research program, etc.
Research Programs
New directions in high energy physics, 12:17139 (RA;CS)
Participation in the ARGUS experiment at the DORIS Collider at Desy, Hamburg, Germany and participation in the AMY experiment at the TRISTAN Collider in Tsukuba, Japan: 1986 progress report, 12:17099 (R;US)
Theoretical investigations in elementary particle physics: Progress report, June 1, 1986-May 31, 1987, 12:17161 (R;US)
HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES
HIGH FLUX NEUTRON SOURCE FACILITY
See NEUTRON SOURCE FACILITIES
HIGH TEMPERATURE GAS COOLED AND GRAPHITE
See HTGR TYPE REACTORS
HIGH-LEVEL RADIOACTIVE WASTES
Classification
Proposed classification scheme for high-level and other radioactive wastes, 12:15458 (J;US)
Inventories
The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
Monitored Retrievable Storage
Radiation doses in alternative commercial high-level waste management systems, 12:15466 (J;US)
Radioactive Waste Disposal
Approach to defining de minimis, intermediate, and other classes of radioactive waste, 12:15459 (J;US)
Optimized application of systems engineering to nuclear waste repository projects, 12:15471 (J;US)
Proposed classification scheme for high-level and other radioactive wastes, 12:15458 (J;US)
Radioactive Waste Processing
Canister grapple for the defense waste processing facility, 12:15482 (J;US)

Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
Equipment experience in a radioactive LFCM vitrification facility, 12:15478 (J;US)
Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant, 12:15477 (J;US)
Remote lighting systems for the defense waste processing facility, 12:15481 (J;US)
Remote viewing of melter interior: defense waste processing facility, 12:15483 (J;US)
Stainless steel decontamination manipulators, 12:15479 (J;US)
Radioactive Waste Storage
Cumulative releases of radionuclides from uncontained waste packages, 12:15475 (J;US)
Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant, 12:15472 (J;US)
Radionuclide transport through penetrations in nuclear waste containers, 12:15474 (J;US)
Underground Disposal
Report of the symposium on 'total research on long life radioactive waste management' in the Research Center for Nuclear Science and Technology, Univ. of Tokyo, 12:15452 (R;JP;In Japanese)
Uranium Nitrates
Operation of a radiochemical uranium nitrate solidification facility, 12:15485 (J;US)
Vitrification
Solubility tests on borosilicate glasses for West Valley waste immobilization, 12:15473 (J;US)
Volume
Process facility modifications project, 12:15393 (J;US)

HIGH-PURITY GE DETECTORS
Electric Fields
Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face, 12:16645 (R;SU;In Russian)
Time Resolution
Time planar HPGe detectors, 12:16632 (R;SU;In Russian)

HIGH-TEMPERATURE FUEL CELLS
See also MOLTEN CARBONATE FUEL CELLS
Materials Testing
Materials for high-temperature fuel cells, 12:16197 (BA;US)

HIGH-VOLTAGE PULSE GENERATORS
Pulse voltage generator for electron cannon supply, 12:16560 (R;SU;In Russian)
Reliability
Reliability of high-voltage electron accelerators, 12:16514 (R;SU;In Russian)

HILACS
Cost Estimation
A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200, 12:17616 (J;US)
Design
A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200, 12:17616 (J;US)

HIPPOCAMPUS
Autoradiography
Studies of aluminum in rat brain, 12:16884 (R;US)

HORIZONTAL AXIS TURBINES
Cost
Price targets for wind turbines in utility applications, 12:15663 (BA;US)
Design
Development of the load spectrum for the Westinghouse WWG-0600 wind turbine, 12:15661 (BA;US)
Price targets for wind turbines in utility applications, 12:15663 (BA;US)
Electric Generators
Development of a maintenance free 10 KW windgenerator, 12:15664 (BA;US)
Fabrication
Development of a maintenance free 10 KW windgenerator, 12:15664 (BA;US)
Maintenance
Development of a maintenance free 10 KW windgenerator, 12:15664 (BA;US)
Performance Testing
Development of the load spectrum for the Westinghouse WWG-0600 wind turbine, 12:15661 (BA;US)
Wind Loads
Development of the load spectrum for the Westinghouse WWG-0600 wind turbine, 12:15661 (BA;US)

HOSPITALS
Energy Conservation
ICP [Institutional Conservation Program] monitoring: Final report, 12:16201 (R;US)
Monitoring
ICP [Institutional Conservation Program] monitoring: Final report, 12:16201 (R;US)

HOT CELLS
Performance
Posting in/out technique in KfK hot cells, 12:16461 (J;US)
Update on active facilities at Harwell, UK, 12:16460 (J;US)
Radiation Protection
Posting in/out technique in KfK hot cells, 12:16461 (J;US)
Remote Handling Equipment
Remote tool development at the interim examination and maintenance (IEM) cell, 12:16001 (J;US)
Remote Viewing Equipment
Remote lighting systems for the defense waste processing facility, 12:15481 (J;US)

HOT-DRY-ROCK SYSTEMS
Rock-Fluid Interactions
Experimental investigations of the reaction between albite and acid hydrothermal solutions, 12:15629 (R;DE;In German)

HOUSEHOLDS
Energy Conservation
Energy conservation, 12:16165 (RA;DE;In German)
Energy Consumption
Determination of household energy using 'fingerprints' from energy billing data, 12:16207 (J;GB)
Energy Demand
REEPS [Residual End-Use Energy Planning] code: User's guide (Residential End-Use Energy Planning System), 12:16181 (R;US)

HTGR TYPE REACTORS
Reactor Accidents
MHTGR confinement radiation releases, 12:16108 (J;US)

HTO
See HEAVY WATER
TRITIUM COMPOUNDS

HUGENHOLTZ-PINES THEORY
See HYDROGEN

HUMAN CELLS
See ANIMAL CELLS

HUMAN POPULATIONS
Dose Equivalents
Environmental radioactivity and radiation exposure in southern Bavaria after the Chernobyl accident, 12:16768 (R;DE;In German)
Radiation Protection
Task group on Reference Man to revise ICRP Publication 23, 12:17334 (J;US)

HUMANS
See HUMAN POPULATIONS

HUMIDITY
Corrosive Effects
The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)

HUNGARIAN PAKS-2 REACTOR
See PAKS-2 REACTOR

HUTCHINSON ISLAND-2 REACTOR
See LUCIE-2 REACTOR

HYBRID ELECTRIC-POWERED VEHICLES
Electric Batteries
Batteries for hybrid vehicles or other high-power applications, 12:16234 (R;US)

HYBRID REACTORS
Breeding Blankets
Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)
Commercialization
The fusion-fission hybrid, 12:17626 (BA;US)
Research Programs
Proceedings of study meeting on nuclear fission-nuclear fusion hybrid reactors, 12:17490 (R;JP;In Japanese)
HYCSOS
See CHEMICAL HEAT PUMPS
HYDRATED ELECTRONS
See SOLVATED ELECTRONS
HYDRAULIC FRACTURES
Geometry
A numerical signal processing technique for borehole seismic fracture diagnostics, 12:15367 (R;US)
Mapping
A numerical signal processing technique for borehole seismic fracture diagnostics, 12:15367 (R;US)
HYDRAULIC RAMS
See PUMPS
HYDRAULICS
Computer Calculations
PC-class microcomputer experience in radiation protection and shielding analysis at INEL, 12:16448 (J;US)
Computerized Simulation
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Modeling of drift effects in CANDU reactors, 12:15844 (J;US)
Information Needs
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Navier-Stokes Equations
Discussion of the numerical stability of an improved upwinding scheme, 12:16481 (J;US)
HYDRIDES
See also CERIUM HYDRIDES
LANTHANUM HYDRIDES
Chemical Preparation
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Chemical Reactions
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Molecular Structure
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
HYDROCARBONS
See also ALKENES
ALKYNES
BENZANTHRACENE
BENZENE
BENZOPYRENE
CAROTENOIDS
POLYCYCLIC AROMATIC HYDROCARBONS
STYRENE
TETRALIN
TOLUENE
Chemical Reactions
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Synthesis
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
HYDROCHLORIC ACID
Chemical Reactions
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
Removal
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
HYDROCYCLONES
See CYCLONE SEPARATORS
HYDROGEN
Bose-Einstein Condensation
Spin-polarized hydrogen: new limitations on high density, 12:17091 (RA;CS)
Charge Exchange
Experimental studies on dissociative charge exchange, 12:17073 (RA;CS)
Chemical Reaction Kinetics
The reaction of atomic hydrogen with the formyl radical, 12:16435 (BA;US)
Chemical Reactions
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Facile reductive cleavage of the C=O bond of acyl halides and the C identical with N bond of nitriles by hydrogen in the presence of sulfido-bridged molybdenum complexes, 12:16415 (J;US)
Combustion Kinetics
Containment loads due to hydrogen combustion, 12:16144 (BA;CA)
Energy Spectra
Temperature dependence of the generalized frequency water spectrum, 12:17307 (R;SU;In Russian)
Measuring Instruments
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
HYDROGEN 1 MINUS BEAMS
Acceleration
Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)
Beam Production
Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)
HYDROGEN 1 TARGET
Antiproton Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
Carbon 12 Reactions
γ-production in peripheral interactions of relativistic carbon nuclei in propane and the anomalon problem, 12:17211 (R;SU)
Pion Minus Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
Proton Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
HYDROGEN 2
See DEUTERIUM
HYDROGEN 3
See TRITIUM
HYDROGEN CHLORIDES
See HYDROCHLORIC ACID

HYDROGEN EMBRITTLEMENT
Control
Evaluation and use of iron dispersants in the Con Edison System, 12:15723 (RA;US)
HYDROGEN HYDROXIDES
See WATER
HYDROGEN IONS 1 MINUS
For H_1^- ions.
Ion Sources
H^- ion source scaling studies at LBL, 12:16566 (R;US)
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Spectroscopic investigation of H^- and D^- ion source plasmas, 12:16564 (R;US)
HYDROGEN METERS
Design
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
Installation
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
Pressure Dependence
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
Temperature Dependence
Development of an in-situ hydrogen measuring instrument for coal liquefaction processes: Quarterly report, October-December 1986, 12:15285 (R;US)
HYDROGEN MINUS 1 BEAMS
See HYDROGEN 1 MINUS BEAMS
HYDROGEN NITRATES
See NITRIC ACID
HYDROGEN PRODUCTION
Coal Gasification
Catalyzed steam gasification of low-rank coals to produce hydrogen, 12:15583 (J;US)
HYDROGEN SULFIDES
Absorption
CNG acid gas removal process: Technical progress report No. 5, 1 October-31 December 1984, 12:15277 (R;US)
HYDROGENATION
Reaction Intermediates
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
Tracer Techniques
Investigation of coal hydrogenation using deuterium as an isotopic tracer, 12:15308 (BA;US)
HYDROLOGY
H Codes
Evaluation and status report on HYDROCOIN at midway (HYDROCOIN: An international project for studying groundwater hydrology modelling strategies), 12:16920 (R;US)
HYDROXYBENZENE
See PHENOL
HYDROXYL IONS
See ANIONS
HYDROXYL RADICALS
Hydroxyl-radical rate-constant intercomparison study. Final report, 12:16718 (R;US)
HYPERFRAGMENTS
See HYPERNUCLEI
HYPERNUCLEI
Sigma Particles
SIGMA hypernuclei: A theoretical review, 12:17299 (R;CA)
HYPERTENSION
Therapy
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
HYPOIODOUS ACID
Volatility
Experimental determination of the partition coefficient of HOI, 12:16104 (J;US)

I

I-BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS
IBR-2 REACTOR
Reactor Noise
Investigation of pattern recognition algorithm to classify the IBR-2 reactor noise spectra, 12:15995 (R;SU;In Russian)
Reactor Stability
Stability of a periodically pulsed reactor, 12:15960 (R;SU;In Russian)
Transfer Functions
Transfer function of a periodically pulsed reactor, 12:15959 (R;SU;In Russian)
ICE
Chemical Composition
Review of the history of atmospheric CO_2 recorded in ice cores, 12:16746 (BA;US)
Isotope Dating
Ice ages, 12:16917 (RA;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
ICF DEVICES
Accelerators
The Compact Torus Accelerator: A driver for ICF, 12:17560 (J;US)
Breakdown
Initiation of long electrical discharges in dense ICF reactor atmospheres, 12:17561 (J;US)
Breeding Blankets
Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
Liquid momentum removal using rod arrays applied to the HYLIFE ICF reactor, 12:17568 (J;US)
Compact Torus
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
The Compact Torus Accelerator: A driver for ICF, 12:17560 (J;US)
Cost Estimation
A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
SAFIRE - A systems analysis code for inertial fusion economics, 12:17591 (J;US)
Design
Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
Ion beam trapping in plasma channels for light ion inertial confinement fusion, 12:17557 (J;US)
Direct Energy Conversion
Turbostar: An ICF reactor using both direct and thermal power conversion, 12:17562 (J;US)
Economic Analysis
A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
Electric Discharges
Initiation of long electrical discharges in dense ICF reactor atmospheres, 12:17561 (J;US)
First Wall
Improved understanding of first-wall vaporization-condensation in inertial confinement fusion reactors, 12:17564 (J;US)
Free Electron Lasers
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Heavy Ion Accelerators
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Ion Beams
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)

Ion beam trapping in plasma channels for light ion inertial confinement fusion, 12:17557 (J;US)
Krypton Fluoride Lasers
Conceptual design of a large E-beam-pumped KrF laser for ICF commercial applications, 12:17558 (J;US)
Conceptual design of a hybrid KrF laser system for ICF commercial applications, 12:17559 (J;US)
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Performance
SAFIRE - A systems analysis code for inertial fusion economics, 12:17591 (J;US)
Rankine Cycle
Turbostar: An ICF reactor using both direct and thermal power conversion, 12:17562 (J;US)
S Codes
SAFIRE - A systems analysis code for inertial fusion economics, 12:17591 (J;US)
Solid State Lasers
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)

ICR HEATING
Magnetoacoustic Waves
Simulation of ion cyclotron resonance heating through resonant absorption in two-ion species plasma, 12:17401 (R;US)
Waveguides
A folded waveguide coupler for ion cyclotron heating, 12:17541 (J;US)

IDAHO CHEMICAL PROCESSING PLANT
Construction
Design and construction status of the fuel processing facility, 12:15392 (J;US)
Design
Design and construction status of the fuel processing facility, 12:15392 (J;US)

IDAHO NATIONAL ENGINEERING LABORATORY
Prior to 1976 known as NRTS and older material is so indexed.
Decommissioning
Idaho National Engineering Laboratory release criteria for decontamination and decommissioning, 12:15551 (RA;US)
Decontamination
Idaho National Engineering Laboratory release criteria for decontamination and decommissioning, 12:15551 (RA;US)

IEA
See INTERNATIONAL ENERGY AGENCY

ILLUMINATION SYSTEMS
See LIGHTING SYSTEMS

IMAGE INTENSIFIERS
Streak Photography
Utilisation of image intensifiers used in conjunction with streak cameras, 12:16670 (R;FR;In French)

IMAGE PROCESSING
Algorithms
Realization of one algorithm for track elements isolation in analyzing the images of nuclear interactions, 12:16638 (R;SU;In Russian)

IMPERFECTIONS
See DEFECTS

IMPERMEABLE DRY ROCK
See HOT-DRY-ROCK SYSTEMS

IMPURITIES
Unwanted constituents, not for TRACE AMOUNTS, INTERFERING ELEMENTS, or metal and nonmetal additions.
Control
Pump limiter experiments and engineering, 12:17577 (J;US)
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)

INCIDENTS
See ACCIDENTS

INCINERATION
See COMBUSTION

INCONEL 600
Intergranular Corrosion
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Performance
Understanding and protecting steam generator materials, 12:15813 (J;US)
Reactor Materials
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Stress Corrosion
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)

INCONEL 718
Mechanical Properties
Behavior of an Inconel 718 container in the presence of hydrogen. Final report (Spacecraft fuel tanks), 12:16270 (R;FR;In French)

INCONEL ALLOYS
See also INCONEL 600
INCONEL 718
Corrosion
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)

IN-CORE FUEL MANAGEMENT
See FUEL MANAGEMENT

INDIA
Nuclear Energy
Annual report 1985-1986 [of the Department of Atomic Energy of the Government of India], 12:17636 (R;IN)
Nuclear Power
Economic case for small and medium power reactors in India, 12:15872 (RA;XA)
Power Reactors
Indian experience in investment cost in Small Size Nuclear Power Reactor Units, 12:15886 (RA;XA)

INDIAN POINT-2 REACTOR
Buchanan, New York, USA
Feedwater
Sound measures feedwater temperature within 1°F consistently, 12:15832 (J;US)

INDICATOR SPECIES
See BIOLOGICAL INDICATORS

INDIUM 111
Labelled Compounds
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)

INDIUM ARSENIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Molecular Beam Epitaxy
Superlattice structures grown by molecular beam epitaxy, 12:16371 (BA;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Superlattices
Superlattice structures grown by molecular beam epitaxy, 12:16371 (BA;US)

INDIUM PHOSPHIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)

Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)

INDIUM SELENIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)

INDOLES
Biological Accumulation
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Root Absorption
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)

INDONESIA
Nuclear Power Plants
Commercial bank contribution in the financing of nuclear plant export contracts, 12:15902 (RA;XA)

INDOOR AIR POLLUTION
Air Pollution Abatement
Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory, 12:16716 (R;US)

INDUSTRIAL PLANTS
See also COAL GASIFICATION PLANTS
COAL LIQUEFACTION PLANTS
FEED MATERIALS PLANTS
ISOTOPE SEPARATION PLANTS
METHANOL PLANTS
Air Pollution Monitoring
Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation, 12:16725 (R;US)

INDUSTRIAL SECTOR
See INDUSTRY

INDUSTRIAL WASTES
Hazardous Materials
Protection of ground water by immobilization of heavy metals in industrial-waste-impacted soil systems, 12:16776 (R;US)
Waste Processing
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)

INDUSTRY
See also CEMENT INDUSTRY
GLASS INDUSTRY
METAL INDUSTRY
PETROLEUM INDUSTRY
Cooperation
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Energy Conservation
Energy savings in the industrial sector - An overview, 12:16223 (BA;US)
Fuel Consumption
Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)
Power Demand
Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)

INERTIAL CONFINEMENT
A dynamic plasma confinement by inertial forces.
Energy Transfer
Equations of one-dimensional radiative hydrodynamics with thermal conductivity and kinetics of thermonuclear burning, 12:17436 (R;SU;In Russian)
Fuel Pellets
Multishell inertial confinement fusion target, 12:17491 (P;US)
Hilacs
A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200, 12:17616 (J;US)
Neutron Cameras
A fiber sensor neutron streak camera for ICF diagnostics, 12:17569 (J;US)
Streak Cameras
A fiber sensor neutron streak camera for ICF diagnostics, 12:17569 (J;US)
Targets
Multishell inertial confinement fusion target, 12:17491 (P;US)
Thermal Conductivity
Equations of one-dimensional radiative hydrodynamics with thermal conductivity and kinetics of thermonuclear burning, 12:17436 (R;SU;In Russian)

INERTIAL CONFINEMENT FUSION DEVICES
See ICF DEVICES

INFORMATION SYSTEMS
Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)

INFRARED RADIATION
Skin Absorption
Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body, 12:16883 (TG;GB)

INFRARED SPECTROMETERS
Calibration
Research in planetary astronomy, 12:16970 (RA;US)
Sensitivity
Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers, 12:16977 (RA;US)
Specifications
Space infrared telescope facility wide field and diffraction limited array camera (IRAC). Semiannual status report, 1 March-31 August 1986, 12:16673 (R;US)

INHIBITORS (CORROSION)
See CORROSION INHIBITORS

INSECTICIDES
See also DIELDRIN
Field Tests
Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)

IN-SITU COMBUSTION
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Combustion Kinetics
Experimental and theoretical studies of reverse combustion in porous media, 12:15331 (BA;US)
Reverse Combustion
Experimental and theoretical studies of reverse combustion in porous media, 12:15331 (BA;US)

INSPECTION
Optical Filters
Optical fiber inspection system, 12:16676 (P;US)

INSTITUTE FOR REACTOR SAFETY
See GES FUER REAKTORSICHERHEIT

INSTRUMENTS (MEASURING)
See MEASURING INSTRUMENTS

INSULATING LIMITERS
See LIMITERS

INSULATION (ELECTRICAL)
See ELECTRICAL INSULATION

INSULATORS (ELECTRICAL)
See ELECTRICAL INSULATORS

INTEGRATED CIRCUITS
Electrical Insulators
Assessment of silicon-on-insulator technologies for VLSI (very large scale integration), 12:16486 (R;US)
Fiber Optics
Integrated optical devices for high speed diagnostics, 12:16493 (R;US)
Field Effect Transistors
Assessment of silicon-on-insulator technologies for VLSI (very large scale integration), 12:16486 (R;US)
INTENSIFIERS (IMAGE)
See IMAGE INTENSIFIERS
INTERACTING BOSON MODEL
Symmetry
Dynamic symmetries in nuclei and molecules, 12:17263 (RA;CS)
INTERGALACTIC SPACE
Cosmic Photons
Ultra-high energy gamma-rays as the carriers of cosmological information, 12:16942 (R;SU)
INTERMEDIATE VECTOR BOSONS
Particle Decay
Heavy flavors, 12:17155 (R;US)
INTERMEDIATE-LEVEL RADIOACTIVE WASTES
Radioactive Waste Disposal
Approach to defining de minimis, intermediate, and other classes of radioactive waste, 12:15459 (J;US)
Optimized application of systems engineering to nuclear waste repository projects, 12:15471 (J;US)
Radioactive Waste Processing
Decontamination of some liquid wastes of medium activity with a new solvent type, 12:15427 (R;FR;In Italian)
Low and medium level liquid waste processing at the new La Hague reprocessing plant, 12:15411 (R;FR;In French)
INTERMEDIATES (REACTION)
See REACTION INTERMEDIATES
INTERMETALLIC COMPOUNDS
Entropy
Thermodynamic data of intermetallic compounds, 12:16238 (R;IN)
INTERNAL COMBUSTION ENGINES
See also DIESEL ENGINES
GAS TURBINE ENGINES
Systems of short-distance heat supply in modular technique, 12:15671 (RA;DE;In German)
Cogeneration
Field of application of cogeneration plants with large engines, 12:15673 (RA;DE;In German)
INTERNATIONAL ENERGY AGENCY
International Agreements
Biomass Conversion Task IV 1987 program of work: International Energy Agency Bioenergy Agreement, 12:15610 (R;US)
INTERNATIONAL NUCLEAR DATA COMMITTEE
Meetings
Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986, 12:17196 (R;XA)
INTERNATIONAL ORGANIZATIONS
See also INTERNATIONAL ENERGY AGENCY
INTERNATIONAL NUCLEAR DATA COMMITTEE
OECD
OPEC
Research Programs
International Centre for Theoretical Physics. Scientific activities in 1985, 12:17195 (R;XA)
INTERNATIONAL TOKAMAK REACTOR
See INTOR TOKAMAK
INTERPLANETARY SPACE
Ultraviolet Spectra
Stellar observations with the Voyager EUV objective grating spectrograph, 12:17020 (RA;US)
INTERSTELLAR SPACE
Infrared Spectra
Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)
Polycyclic Aromatic Hydrocarbons
Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)
INTOR TOKAMAK
International Tokamak Reactor.
Design
International Tokamak Reactor (INTOR), 12:17495 (J;US)
INVAR
Physical Radiation Effects
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
IODIDES
See also GOLD IODIDES
MOLYBDENUM IODIDES
Crystal Lattices
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)
Electron-Phonon Coupling
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)
Environmental Transport
Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)
Transition Temperature
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)
IODINE
Detection
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)
Volatility
Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
IODINE 109
Proton Emission Decay
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
IODINE 123
Radioimmunoassay
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
Therapeutic Uses
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
IODINE 125
Uptake
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
IODINE BROMIDES
Crystal Lattices
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)
Electron-Phonon Coupling
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)
Transition Temperature
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ ($X^- = IBr_2^-$, AuI_3^-, I_3^-), 12:16412 (J;US)

IODINE COMPOUNDS
See also HYPOIODOUS ACID
IODIDES
IODINE BROMIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
IODINE IODIDES
See IODINE
ION ACOUSTIC WAVES
Non-dispersive ion waves
Wave Propagation
Echo in a magnetized low-turbulent plasma, 12:17408 (R;SU;In Russian)
ION BEAM FUSION REACTORS
Beam Optics
Gain scaling relations for heavy-ion targets, 12:17617 (J;US)
Beam Transport
Heavy ion beam transport in ICF reaction chambers, 12:17619 (J;US)
Computerized Simulation
A systems performance and cost model for heavy ion fusion, 12:17620 (J;US)
Cost Estimation
A systems performance and cost model for heavy ion fusion, 12:17620 (J;US)
Design
A comparison of the design and costs of induction LINAC drivers for inertial fusion using ions of mass 133 and 200, 12:17616 (J;US)
Heavy-ion fusion: Future promise and future directions, 12:17588 (J;US)
Reactor designs for heavy-ion fusion, 12:17618 (J;US)
Scaling of vaporization and condensation in heavy ion fusion reactors, 12:17565 (J;US)
Feasibility Studies
Gain scaling relations for heavy-ion targets, 12:17617 (J;US)
Heavy-ion fusion: Setting the stage, 12:17615 (J;US)
Hilacs
A systems performance and cost model for heavy ion fusion, 12:17620 (J;US)
Heavy ion fusion systems assessment - An overview, 12:17621 (J;US)
Reactor designs for heavy-ion fusion, 12:17618 (J;US)
Ion Beam Injection
Scaling of vaporization and condensation in heavy ion fusion reactors, 12:17565 (J;US)
Ion Beam Targets
Heavy-ion fusion target cost model, 12:17563 (J;US)
Numerical simulation of an ICF target explosion in a stratified gas atmosphere, 12:17566 (J;US)
Magnetohydrodynamics
MHD energy conversion with advanced-fuel ion beam fusion, 12:17567 (J;US)
Mathematical Models
Heavy ion fusion systems assessment - An overview, 12:17621 (J;US)
Performance
A systems performance and cost model for heavy ion fusion, 12:17620 (J;US)
Reviews
Heavy-ion fusion: Setting the stage, 12:17615 (J;US)
Heavy ion fusion systems assessment - An overview, 12:17621 (J;US)
ION BEAM TARGETS
Computerized Simulation
Numerical simulation of an ICF target explosion in a stratified gas atmosphere, 12:17566 (J;US)
Cost Estimation
Heavy-ion fusion target cost model, 12:17563 (J;US)
Design
MHD energy conversion with advanced-fuel ion beam fusion, 12:17567 (J;US)
Explosions
Numerical simulation of an ICF target explosion in a stratified gas atmosphere, 12:17566 (J;US)
Gain
Gain scaling relations for heavy-ion targets, 12:17617 (J;US)
Nuclear Fireball Model
Numerical simulation of an ICF target explosion in a stratified gas atmosphere, 12:17566 (J;US)
Scaling Laws
Gain scaling relations for heavy-ion targets, 12:17617 (J;US)
ION BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS
ION BEAMS
See also HYDROGEN 1 MINUS BEAMS
POTASSIUM 41 BEAMS
Irradiation Procedures
Positive ion irradiation facility, 12:16862 (RA;US)
Performance
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Trapping
Ion beam trapping in plasma channels for light ion inertial confinement fusion, 12:17557 (J;US)
ION COLLISIONS
See also ION-ATOM COLLISIONS
ION-ION COLLISIONS
ION-MOLECULE COLLISIONS
Electron Capture
Ionization and charge transfer in high-energy ion-atom collisions, 12:17081 (R;US)
ION CYCLOTRON-RESONANCE HEATING
See ICR HEATING
ION DETECTION
Telescope Counters
Development of an universal particle telescope with large dynamics for light and medium heavy fragments, 12:16612 (R;DE;In German)
ION IMPLANTATION
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
ION MICROSCOPY
Surface Properties
Electron and ion beams in surface investigation of solids, 12:17345 (RA;CS)
ION SOURCES
Cusped Geometries
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Electron Cyclotron-Resonance
ECR [Electron Cyclotron Resonance] ion sources for cyclotrons, 12:16567 (R;US)
Laser-Produced Plasma
Influence of the crater at the target surface on the ion outflow from laser produced plasma, 12:16562 (R;SU;In Russian)
Magnetic Filters
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Multicharged Ions
Influence of the crater at the target surface on the ion outflow from laser produced plasma, 12:16562 (R;SU;In Russian)
Operation
Operation of a magnetically filtered multicusp volume source, 12:16563 (R;US)
Performance
Surface ionization ion source with high current, 12:16537 (R;CN;In Chinese)
Plasma
Spectroscopic investigation of H^- and D^- ion source plasmas, 12:16564 (R;US)
Scaling Laws
H^- ion source scaling studies at LBL, 12:16566 (R;US)
Surface Ionization
Surface ionization ion source with high current, 12:16537 (R;CN;In Chinese)

ION-ATOM COLLISIONS
Charge Exchange
Collisional dynamics of low energy charge transfer processes, 12:17077 (RA;CS)
Electron Capture
Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22, 12:17071 (R;DE)
Excited States
Atomic physics of strongly correlated systems: Progress report, 1 August 1984 through 31 July 1985, 12:17068 (R;US)
Mathematical Models
An overview of low-energy ion-atom collisions, 12:17067 (R;US)
Pair Production
Scalar magnetic (e/sup +/e/sup -/) resonance as possible source of an anomalous e/sup +/ peak in heavy-ion collisions, 12:17084 (J;NL)
ION-DRAG ACCELERATORS
See ELECTRON-RING ACCELERATORS
IONIC CRYSTALS
Grain Boundaries
Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
IONIC REACTIONS
See IONS
ION-ION COLLISIONS
Biophysics
Structured ion impact: double differential cross sections, 12:17316 (RA;US)
Differential Cross Sections
Theoretical cross sections for ionization structured ions, 12:17317 (RA;US)
IONIZATION CALORIMETERS
See SHOWER COUNTERS
IONIZATION CHAMBERS
Computerized Simulation
Development and testing of a Monte Carlo code system for analysis of ionization chamber responses, 12:16661 (J;US)
Design
Portable wide range instrument for beta radiation monitoring with minimum angular dependence, 12:16598 (RA;US)
Performance
Comparison of the response of a NaI scintillation crystal with a pressurized ionization chamber as a function of altitude, radiation level, and Ra-226 concentration, 12:15530 (RA;US)
Portable wide range instrument for beta radiation monitoring with minimum angular dependence, 12:16598 (RA;US)
IONIZING RADIATIONS
See also COSMIC RADIATION
GAMMA RADIATION
X RADIATION
Uses
CSKAE activity in the field of ionizing radiation applications in agriculture and food industry, 12:16845 (RA;CS;In Czech)
ION-MOLECULE COLLISIONS
Charge Exchange
Collisional dynamics of low energy charge transfer processes, 12:17077 (RA;CS)
Inelastic Scattering
Time of flight experiments of the and H/sup +/ scattered from molecules and solid surfaces, 12:17072 (RA;CS)
IONOSPHERE
Cosmic Electrons
Energy spectra of secondary electrons with E>100 MeV at altitudes of 300-500km for shells of L=2-4, 12:17284 (RA;SU;In Russian)
IONS
Ions in solutions are indexed as compounds; ions in gases by the precoordinated descriptor consisting of the element name and the term ions; ions in beams by assigning either the specific name if available, e.g. ARGON 40 BEAMS
See also ANIONS
DEUTERIUM IONS
GOLD IONS
MULTICHARGED IONS
NICKEL IONS
Acceleration
Particle acceleration by turbulent plasmas, 12:16946 (RA;CS)
Chemical Reaction Yield
Ion yields in liquid water, 12:17322 (RA;US)
Total ion and electron yields, 12:17318 (RA;US)
Resonance Ionization Mass Spectroscopy
High efficiency direct detection of ions from resonance ionization of sputtered atoms, 12:16396 (P;US)
IOWA
Atmospheric Precipitations
Tree ring chronology indexes and reconstructions of precipitation in Central Iowa, USA, 12:16689 (R;US)
IPNS-I SYNCHROTRON
Intense Pulsed Neutron Source.
Targets
Progress on the IPNS Enriched Uranium Booster Target, 12:16542 (R;US)
IRIDIUM ISOTOPES
Rotational States
High-spin states and coexisting states in the Pt-Au transition region, 12:17235 (R;US)
IRON
Catalytic Effects
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Chemical Reactions
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
Cross Sections
Evaluation and testing of double differential Fe(n,n') cross sections, 12:17327 (J;US)
Crystal Defects
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
Dislocations
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
Electrodeposition
Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Hydrogen Additions
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
Inclusions
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
Magnetic Properties
Magnetic properties of novel epitaxial films, 12:16254 (R;US)
Neutron Reactions
Calculation of damage cross section, 12:17305 (R;IN)
IRON 54
Dimensions
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
Spectral Shift
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
IRON 54 TARGET
Nickel 58 Reactions
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
IRON 56
Dimensions
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)

IRON 56 TARGET
Neutron Reactions
Measurement of inelastically scattering neutron spectra from the (n,n'γ) reaction on iron nuclei, 12:17213 (R;SU;In Russian)
IRON 58
Dimensions
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
Spectral Shift
Muonic isotope shifts in the even Fe nuclei, 12:17224 (J;US)
IRON ALLOYS
See also HASTELLOYS
INCONEL 600
IRON BASE ALLOYS
VANSTAR 7
Corrosion Resistance
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Ion Implantation
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
IRON BASE ALLOYS
See also INVAR
STEELS
Physical Radiation Effects
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
Tensile Properties
Effect of aluminum addition on ductility and yield strength of Fe_3Al alloys with 0.5 wt % TiB_2, 12:16258 (R;US)
Mechanical properties of various alloys in hydrogen. Final report, 12:16289 (R;US)
IRON COMPOUNDS
See also FERRITES
IRON SILICIDES
Air Pollution Control
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Crystal Structure
Further aspects of the structure and magnetism of the layered compound Fe(III)ClMoO4: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
Environmental Impacts
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Magnetic Susceptibility
Further aspects of the structure and magnetism of the layered compound Fe(III)ClMoO4: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
IRON METEORITES
X-Ray Fluorescence Analysis
Applications of synchrotron x-ray fluorescence to extraterrestrial materials, 12:16535 (R;US)
IRON SILICIDES
Reduction
Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
IRON-NICKEL BATTERIES
Performance
Temperature effects on nickel/iron battery characteristics, 12:16149 (R;US)
ISLANDS
See also INDONESIA
TAIWAN
Decommissioning
Johnston Atoll site cleanup - some practical concerns, 12:15521 (RA;US)
Decontamination
Johnston Atoll site cleanup - some practical concerns, 12:15521 (RA;US)
ISOBARIC ANALOGS
Data Compilation
Coulomb displacement energies between analog levels for 44 < = A < = 239, 12:17218 (R;FR)
ISOCHRONOUS CYCLOTRONS
See also KIEV CYCLOTRON
TRIUMF CYCLOTRON
Beam Monitoring
On the proton beam characteristic detection in a cyclotron on multiple beam passage through a target, 12:16558 (RA;SU;In Russian)
Proton Beams
On the proton beam characteristic detection in a cyclotron on multiple beam passage through a target, 12:16558 (RA;SU;In Russian)
ISOTOPE SEPARATION PLANTS
Decommissioning
Environmental assessment relating to the decommissioning of Strontium Semiworks facility, 12:15503 (RA;US)
ITALY
Energy Policy
The Italian programmes for wind energy, 12:15659 (BA;US)
Fossil-Fuel Power Plants
Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service, 12:15730 (RA;US)
Research Programs
Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service, 12:15730 (RA;US)
Wind Power
The Italian programmes for wind energy, 12:15659 (BA;US)

J

J-3105 RESONANCES
See PSI-3105 RESONANCES
JAHN-TELLER EFFECT
Reviews
Proximity effect in molecular photophysics: dynamical consequences of Pseudo-Jahn-Teller interaction, 12:16426 (J;US)
JAPAN
Fossil-Fuel Power Plants
Fossil plant water chemistry in Japan, 12:15729 (RA;US)
Nuclear Facilities
Influence of gamma-ray skyshine on nuclear facilities design, 12:16117 (J;US)
Nuclear Power Plants
Influence of gamma-ray skyshine on nuclear facilities design, 12:16117 (J;US)
PWR Type Reactors
Improvement in steam generator level control, 12:15817 (J;US)
JET MODEL
Gluons
Study of gluon scattering and gluon fragmentation in high P/sub T/ interactions at the ISR, 12:17121 (J;DE)
JET REACTORS
See JET TOKAMAK
JET TOKAMAK
Limiters
Surface analysis of a central part of the JET graphite limiter, 12:17435 (R;DE)
JOINT VENTURES
Feasibility Studies
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Information Needs
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Legal Aspects
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)

JOSEPHSON JUNCTIONS
Critical Field
Nature of coupling and dimensional crossover in superconducting multilayers, 12:17354 (R;US)
JUPITER PLANET
Absorption Spectra
Infrared observations of small solar-system bodies, 12:17001 (RA;US)
Accretion Disks
Planetary optical and infrared imaging, 12:17022 (RA;US)
Ammonia
Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
Carbon Monoxide
Infrared spectroscopy of Jupiter and Saturn, 12:16980 (RA;US)
Deuterium Compounds
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Spectroscopic observations of the planets, 12:16986 (RA;US)
Dusts
Theoretical and observational planetary physics, 12:16973 (RA;US)
Emission Spectra
Modeling and investigative studies of Jovian low frequency emissions, 12:16982 (RA;US)
Ethane
Advanced infrared astronomy, 12:16971 (RA;US)
Hydromagnetic Waves
Analysis of Jovian decametric data: study of radio emission mechanisms, 12:16991 (RA;US)
Infrared Spectra
Infrared observations of outer planet satellites, 12:16978 (RA;US)
Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers, 12:16977 (RA;US)
Planetary optical and infrared imaging, 12:17022 (RA;US)
Magnetic Fields
Pioneer 10 and 11 (Jupiter and Saturn) magnetic field experiments. Final report, 12:17032 (R;US)
Phosphines
Spectroscopic observations of the planets, 12:16986 (RA;US)
Plasma
Ground-based observations of the Jupiter plasma torus, 12:16987 (RA;US)
Polar Regions
Theoretical and observational planetary physics, 12:16973 (RA;US)
Radiowave Radiation
Analysis of Jovian decametric data: study of radio emission mechanisms, 12:16991 (RA;US)
Satellites
Infrared observations of outer planet satellites, 12:16978 (RA;US)
Research in planetary astronomy and operation of the 2.2-meter telescope, 12:16976 (RA;US)
Sodium Compounds
High-resolution imaging of solar system objects, 12:16975 (RA;US)
Stratosphere
Theoretical and observational planetary physics, 12:16973 (RA;US)
Temperature Distribution
Infrared observations of planetary atmospheres, 12:16985 (RA;US)

K

K01
See KAONS NEUTRAL SHORT-LIVED
K-25 PLANT
See ORGDP
KAHL-MAIN REACTOR
See HDR REACTOR
KALPAKKAM LMFBR REACTOR
Fuel Pellets
Computerised automatic pellet inspection unit for FBTR fuel, 12:15955 (R;IN)
KALUZA-KLEIN THEORY
Compactification
More dimensions - Less inflation, 12:17393 (BA;US)
KAON PLUS-PROTON INTERACTIONS
Inclusive Interactions
Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c, 12:17104 (R;SU;In Russian)
KAONS 1
See KAONS NEUTRAL SHORT-LIVED
KAONS NEUTRAL
See also KAONS NEUTRAL SHORT-LIVED
Mass Difference
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
Quark Model
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
KAONS NEUTRAL SHORT-LIVED
Particle Production
Λ hyperon and K/sup 0/ meson production in Cp and CC interactions at 4.2 GeV/c per nucleon, 12:17116 (R;SU;In Russian)
KAONS PLUS
Mass Difference
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
Quark Model
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
KARLSRUHE NUCLEAR RESEARCH CENTER
See KERNFORSCHUNGSZENTRUM KARLSRUHE
KEK SYNCHROTRON
Japan National Lab for High Energy Physics Synchrotron.
Beam Dynamics
Photon factory, 12:16505 (RA;US)
Design
ISSP-KEK new light source project, 12:16506 (RA;US)
Operation
Photon factory, 12:16505 (RA;US)
Planning
ISSP-KEK new light source project, 12:16506 (RA;US)
KERNFORSCHUNGSZENTRUM KARLSRUHE
Hot Cells
Posting in/out technique in KfK hot cells, 12:16461 (J;US)
KETONES
Chemical Preparation
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Properties
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Reactions
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Crystal Structure
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
KIEV CYCLOTRON
Two-stage acceleration system of high intensity proton beam up tω energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)
On-Line Control Systems
Problems and perspectives of the U-240 control system development, 12:16510 (R;SU;In Russian)

Software of the module of automatic control system by power supply of the U-240 cyclotron, 12:16511 (R;SU;In Russian)
KILNS
Air Pollution Control
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln, 12:15314 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)
KNOCK-ON ELECTRONS
See ELECTRONS
KNOWLEDGE BASE
Design
Automated reasoning and knowledge base design in the scientific programming environment, 12:17643 (R;US)
KOREA (SOUTH)
See REPUBLIC OF KOREA
KRYPTON
Ion-Atom Collisions
Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22, 12:17071 (R;DE)
KRYPTON FLUORIDE LASERS
Design
Conceptual design of a large E-beam-pumped KrF laser for ICF commercial applications, 12:17558 (J;US)
Conceptual design of a hybrid KrF laser system for ICF commercial applications, 12:17559 (J;US)
Electron Beam Pumping
Conceptual design of a large E-beam-pumped KrF laser for ICF commercial applications, 12:17558 (J;US)
Performance
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)

L

LA CROSSE BOILING WATER REACTOR
See LACBWR REACTOR
LA REINA REACTOR
See RESEARCH REACTORS
LA SALLE COUNTY-1 REACTOR
Reactor Safety
Stimulator-based model for estimating operator diagnosis failure probabilities, 12:16101 (J;US)
LA SALLE COUNTY-2 REACTOR
Reactor Safety
Stimulator-based model for estimating operator diagnosis failure probabilities, 12:16101 (J;US)
LACBWR REACTOR
Radiation Protection
Operational radiation protection for reducing cumulative exposure at a boiling water reactor, 12:16118 (J;US)
LAGE FLUX REAKTOR PETTEN
See LFR REACTOR
LAKES
PH Value
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Pollutants
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
LAMBDA 2282 RESONANCES
See LAMBDA C PLUS
LAMBDA C PLUS
Prior to Jan. 1985 this information was indexed with the descriptor Lambda-2250 Resonances.
Semileptonic Decay
Semileptonic decays of ordinary and charmed Λ/sup +/sub(c) baryons in chiral theory, 12:17145 (R;SU)
LAMBDA NEUTRAL
See LAMBDA PARTICLES
LAMBDA PARTICLES
Particle Production
Λ hyperon and K/sup 0/ meson production in Cp and CC interactions at 4.2 GeV/c per nucleon, 12:17116 (R;SU;In Russian)
Experimental results on spin physics at the AGS, 12:17096 (R;US)
Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)
Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c, 12:17104 (R;SU;In Russian)
LAMBDA-2250 RESONANCES
See LAMBDA C PLUS
LAMBDA-2260 RESONANCES
See LAMBDA C PLUS
LAMBS
See SHEEP
LAMINOGRAPHY
See TOMOGRAPHY
LAND POLLUTION
Biological Indicators
Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene (Lepomis macrochirus; Ondatra zibethica; Blarina brevicauda), 12:16892 (RA;US)
LAND USE
Variations
Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
LANGMUIR OSCILLATIONS
See PLASMA WAVES
LANTHANUM
Emission Spectroscopy
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
LANTHANUM CHROMITES
See CHROMIUM OXIDES
LANTHANUM OXIDES
LANTHANUM HYDRIDES
Crystal Structure
Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)
Crystal-Phase Transformations
Symmetrized coordinate method in profile analysis for commensurable structure phase transformations, 12:17349 (R;SU;In Russian)
LANTHANUM NITRIDES
Electronic Structure
Electronic structure of LaN; prediction of a small band overlap semi-metal, 12:16342 (J;GB)
LANTHANUM OXIDES
Crystallography
The elastic properties of LaNbO/sub 4/, 12:16340 (BA;US)
Elasticity
The elastic properties of LaNbO/sub 4/, 12:16340 (BA;US)
LASER FUSION REACTORS
Electric Cables
High-voltage cable lead-in for pulse techniques, 12:17485 (R;SU;In Russian)
LASER RADIATION
Opacity
Opacity calculations for laser plasma applications, 12:17411 (R;US)
LASER SPECTROSCOPY
See also RAMAN SPECTROSCOPY

Collinear laser spectroscopy: a new tool in nuclear physics, 12:16625 (RA;CS)

LASER TARGETS
Erosion
Influence of the crater at the target surface on the ion outflow from laser produced plasma, 12:16562 (R;SU;In Russian)

LASER WELDING
Metallography
Laser welding metallography (Of ultra-small parts), 12:16299 (R;US)
Plasma Diagnostics
The influence of a plasma during laser welding, 12:16473 (BA;US)
Research Programs
The influence of a plasma during laser welding, 12:16473 (BA;US)

LASER-PRODUCED PLASMA
Absorption
Absorption of aluminium X-ray lines in a laser created gold plasma, 12:17398 (R;FR)
Ionization
Review of X-ray laser research at CEL-V, 12:16463 (R;FR)
Plasma Acceleration
Electron acceleration by a localized electric field, 12:17396 (R;FR)
Model for the acceleration of laser irradiated targets, 12:17431 (R;FR)
Plasma Diagnostics
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Plasma Focus Devices
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Population Inversion
Ionization model for nickel-like gold, 12:16464 (R;FR)
Review of X-ray laser research at CEL-V, 12:16463 (R;FR)
Resonance Absorption
Electron acceleration by a localized electric field, 12:17396 (R;FR)
X Radiation
Absorption of aluminium X-ray lines in a laser created gold plasma, 12:17398 (R;FR)

LASERS
Light Amplification by Stimulated Emission of Radiation.
See also FREE ELECTRON LASERS
GAS LASERS
SEMICONDUCTOR LASERS
SOLID STATE LASERS
X-RAY LASERS
Momentum Transfer
Plasma energy balance model for optical-laser-induced impulse in vacuo, 12:16466 (R;US)

LASL
Computer Networks
An overview of computing at Los Alamos, 12:17678 (BA;US)

LATEROLOGGING
See RESISTIVITY LOGGING

LATTICE DEFECTS
See CRYSTAL DEFECTS

LATTICE FIELD THEORY
Fermions
Chiral order parameter of Wilson fermion formulation in a lattice CP/sup N-1/ model, 12:17181 (R;DK)
Monte Carlo Method
Hadron spectroscopy using Monte Carlo technique in lattice gauge theory, 12:17141 (RA;CS)
Thermodynamics
Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)
Yang-Mills Theory
Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)

LEACHATES
Chemical Composition
Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils, 12:16775 (R;DE;In German)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Quantitative Chemical Analysis
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)

LEAD
Body Burden
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
Ecological Concentration
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Neutron Reactions
Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters, 12:17252 (R;SU;In Russian)
Proton Reactions
Correlations between neutrons with small relative momenta produced in p-Pb interactions at 7,5 GeV/c, 12:17238 (R;SU)
Tissue Distribution
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
Waste Disposal
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)

LEAD 204 TARGET
Neutron Emission
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)
Neutron Reactions
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)

LEAD 206 TARGET
Neutron Emission
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)
Neutron Reactions
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)

LEAD 207 TARGET
Neutron Emission
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)
Neutron Reactions
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)

LEAD 208 TARGET
Alpha Reactions
Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)
Carbon 12 Reactions
Giant resonance excitation by inelastic scattering of medium energy ^{12}C ions, 12:17233 (R;FR)
Neutron Emission
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)
Neutron Reactions
Neutron emission from lead bombarded with 14 MeV neutrons, 12:17237 (RA;CS)

Proton Reactions
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
LEAD 210
Tissue Distribution
Age dependent retention of ^{212}Pb in the skeleton following ^{224}Ra uptake, 12:16857 (R;US)
LEAD 212
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
LEAD COMPOUNDS
See also LEAD OXIDES
PZT
Air Pollution Control
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Environmental Impacts
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
LEAD OXIDES
Fracture Mechanics
Fracture mechanisms in lead zirconate titanate ceramics, 12:16338 (BA;US)
LEAD ZIRCONITE TITANATE
See PZT
LEAK DETECTORS
Performance
Acoustic leak detection in fossil fueled boilers, 12:15699 (RA;US)
Critical review of acoustic and acoustic emission leak detection in boilers, 12:15701 (RA;US)
Leak detection by acoustic emission monitoring in power plant high pressure preheaters, 12:15700 (RA;US)
LEAKAGE
See LEAKS
LEAKAGE (NEUTRON)
See NEUTRON LEAKAGE
LEAKS
Acoustic Detection
Acoustic leak detection in fossil fueled boilers, 12:15699 (RA;US)
Acoustic leak detection in nuclear power plants, 12:15945 (RA;US)
Critical review of acoustic and acoustic emission leak detection in boilers, 12:15701 (RA;US)
Leak detection by acoustic emission monitoring in power plant high pressure preheaters, 12:15700 (RA;US)
Detection
Initial feasibility study of halogen tracer method for finding boiler tube leaks, 12:15703 (RA;US)
Monitoring and diagnostic system for reactor coolant pump seals, 12:15947 (RA;US)
Reactor coolant pump seal leakage monitoring, 12:15946 (RA;US)
LEPIDOPTERA
Tomography
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
LEPTON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET
LEPTONS
See also ELECTRONS
NEUTRINOS
Multiple Production
Hadronic production of leptons and photons, 12:17137 (RA;CS)
LFR REACTOR
Specifications
Operation and utilization of the Argonaut type low flux reactor, 12:15991 (RA;XA)
Uses
Operation and utilization of the Argonaut type low flux reactor, 12:15991 (RA;XA)
LIABILITIES
Victims Compensation
Limiting the liability of the nuclear operator, 12:16059 (R;XN;In English and French)
LI-DRIFTED GE DETECTORS
Doped Materials
Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face, 12:16645 (R;SU;In Russian)
Electric Fields
Electric field distribution and impurity concentration in coaxial high purity HP-Ge- and Ge(Li)-detectors with one-open face, 12:16645 (R;SU;In Russian)
LIE GROUPS
Irreducible Representations
Kronecker products which decompose into two irreducible representations, 12:17374 (R;SU)
LIGHT
See VISIBLE RADIATION
LIGHT NUCLEI
For nuclei with mass 1-40.
See also ARGON 38
ARGON 39
BERYLLIUM 12
BERYLLIUM 9
CALCIUM 40
CARBON 12
CARBON 13
CHLORINE 39
DEUTERIUM
FLUORINE 24
LITHIUM 11
LITHIUM 6
LITHIUM 7
LITHIUM 8
LITHIUM 9
OXYGEN 22
PHOSPHORUS 31
PHOSPHORUS 37
PHOSPHORUS 38
POTASSIUM 39
SILICON 35
SILICON 36
SULFUR 38
TRITIUM
Beta Decay
First forbidden beta decay in light nuclei, 12:17303 (BA;US)
Electron Reactions
Electron scattering from light nuclei in the regions of quasi-elastic peak and Δ-isobar excitation, 12:17259 (R;SU)
Monte Carlo Method
Variational Monte Carlo calculations of few-body nuclei, 12:17206 (R;US)
LIGHT SCATTERING
Mathematical Models
Light diffusion through clouds and haze, 12:16698 (J;US)
LIGHT WATER COOLED REACTORS
See WATER COOLED REACTORS
LIGHTING SYSTEMS
Bibliographies
Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)
Evaluation
Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)
LIGNITE
Combustion Kinetics
Single-particle combustion of Beulah lignite char, 12:15332 (BA;US)
Devolatilization
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Pyrolysis
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Surface Area
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the

period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
LIMITERS
Cooling
Design window for liquid metal-cooled limiters, 12:17578 (J;US)
Design
Design window for liquid metal-cooled limiters, 12:17578 (J;US)
Eddy Currents
Experimental modelling of eddy currents and deflection for tokamak limiters, 12:17584 (J;US)
Impurities
Pump limiter experiments and engineering, 12:17577 (J;US)
Surface analysis of a central part of the JET graphite limiter, 12:17435 (R;DE)
Self-Pumping Systems
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
LINACS
See LINEAR ACCELERATORS
LINEAR ACCELERATORS
See also ATLAS SUPERCONDUCTING LINAC
HILACS
QUADRUPOLE LINACS
SACLAY LINAC
STANFORD LINEAR COLLIDER
Augmentation
High field electron linacs, 12:16529 (R;FR)
Beam Injection
A 300 kV isolation platform at the University of Washington, 12:16543 (R;US)
Brightness
High-brightness rf linear accelerators, 12:16513 (R;US)
Electron Beams
Experimental study of two-beam resonator accelerator in a pulse mode, 12:16515 (R;SU;In Russian)
RF Systems
High-brightness rf linear accelerators, 12:16513 (R;US)
LIQUEFIED NATURAL GAS
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
LIQUEFIED PETROLEUM GASES
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
LIQUID ASPHALT
See PETROLEUM RESIDUES
LIQUID EFFLUENTS
See LIQUID WASTES
LIQUID FUELS
Combustion
Analysis of coal and coal liquid combustion products, 12:15330 (RA;US)
LIQUID METAL COOLANT
See LIQUID METALS
LIQUID METAL COOLED REACTORS
See also LMFBR TYPE REACTORS
ATWS
Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A, 12:16075 (J;US)
Reactor Cores
Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A, 12:16075 (J;US)
Impacts of reactivity feedback uncertainties on inherent shutdown in innovative designs, 12:16076 (J;US)
Reactor Safety
Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A, 12:16075 (J;US)
Impacts of reactivity feedback uncertainties on inherent shutdown in innovative designs, 12:16076 (J;US)
LIQUID METAL TEST FACILITIES
See TEST FACILITIES
LIQUID METALS
Flow Models
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Flow Rate
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Techniques for measurement of velocity in liquid-metal MHD flows, 12:17518 (J;US)
Heat Transfer
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Laminar Flow
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Magnetohydrodynamics
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Pressure Drop
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Temperature Effects
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Temperature Gradients
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
LIQUID SCINTILLATION DETECTORS
Non-accelerator particle physics: Progress report for period February 1, 1986-January 31, 1987, 12:17100 (R;US)
LIQUID WASTES
See also WASTE WATER
Radioactive Waste Processing
Decontamination of some liquid wastes of medium activity with a new solvent type, 12:15427 (R;FR;In Italian)
LIQUID-METAL MHD GENERATORS
Reviews
Liquid Metal MHD Generator Systems, 12:16185 (R;IN)
LITHIUM
Auger Electron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
Chemical Reaction Kinetics
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Environmental Transport
Interpretative analysis of data for solute transport in the unsaturated zone, 12:15440 (R;US)

Photoelectron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
Pressure Effects
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Safety
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Temperature Effects
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)

LITHIUM 11
Nuclear Radii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)

LITHIUM 6
Nuclear Radii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)

LITHIUM 6 TARGET
Neutron Reactions
A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries, 12:17540 (J;US)

LITHIUM 7
Nuclear Radii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)

LITHIUM 7 TARGET
Neutron Reactions
A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries, 12:17540 (J;US)

LITHIUM 8
Nuclear Radii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)

LITHIUM 9
Nuclear Radii
Measurements of interaction cross sections and nuclear radii of Li isotopes, 12:17210 (R;JP)

LITHIUM ALLOYS
Grain Growth
Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy, 12:16304 (J;US)
Microstructure
Small angle X-ray scattering (SAXS) study of coarsening kinetics in an aluminum-lithium alloy, 12:16304 (J;US)
X-Ray Spectra
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)

LITHIUM COMPOUNDS
See also LITHIUM OXIDES
LITHIUM SULFATES
Crystal Defects
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Electric Conductivity
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Physical Radiation Effects
Irradiation damage in γ-$LiA10_2$, 12:16326 (R;FR)
Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Study of a breeding material - γ lithium aluminate, 12:17428 (R;FR)
Seebeck Effect
Electronic defects in $LiFeO_2$, 12:16190 (R;US)

LITHIUM FLUORIDES
Crystal Defects
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Optical Properties
Soft x-ray emission spectra of lithium fluoride excited by synchrotron radiation, 12:17353 (R;US)
Spectra
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)

LITHIUM OXIDES
Qualitative Chemical Analysis
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)
Thermodynamic Properties
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)

LITHIUM SULFATES
Calibration Standards
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)

LITHIUM-SULFUR BATTERIES
Design
Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system, 12:16151 (BA;US)
Lithium alloy/iron sulfide batteries, 12:16150 (BA;US)
Fabrication
Lithium alloy/iron sulfide batteries, 12:16150 (BA;US)
Manufacturing
Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system, 12:16151 (BA;US)
Performance
Lithium alloy/iron sulfide batteries, 12:16150 (BA;US)
Performance Testing
Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system, 12:16151 (BA;US)
Reliability
Improved reliability of Li/SO/sub 2/ cells through use of an automated inspection system, 12:16151 (BA;US)

LIVER
Neoplasms
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)

LMFBR TYPE REACTORS
See also EBR-2 REACTOR
KALPAKKAM LMFBR REACTOR
Breeding Blankets
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Fission Products
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)
Fuel Cans
Design limits for HT9 cladding using stress-induced aging data, 12:15855 (R;US)
European effort on materials, 12:16244 (R;FR)
Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
Fuel Elements
Factors controlling metal fuel lifetime, 12:15850 (R;US)
Recent irradiation tests of uranium-plutonium-zirconium metal fuel elements, 12:15848 (R;US)
Fuel Motion Detection
Part I. Fuel-motion diagnostics in support of fast-reactor safety experiments. Part II. Fission product detection system in support of fast reactor safety experiments, 12:16014 (R;US)
Fuel Pins
Fission gas retention and axial expansion of irradiated metallic fuel, 12:15849 (R;US)
Performance of liquid metal reactor fuel pins with D9 cladding, 12:15853 (R;US)
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Heat Exchangers
Validation of an intermediate heat exchanger model for real-time analysis, 12:15859 (J;US)
Heterogeneous Reactor Cores
Monte Carlo narrow resonance calculational techniques for treating double-heterogeneity effects, 12:15858 (J;US)

Leak Testing
Advances in sodium technology, testing and diagnostics of fast reactors, 12:15856 (R;CS;In Czech and Russian)
Materials Testing
The U.S. fast reactor materials and structures program, 12:15866 (BA;US)
Mixed Oxide Fuels
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
Primary Coolant Circuits
The development of a cavitation free sodium pump for the breeder reactor, 12:15851 (R;US)
Reactor Components
Decontamination process for hot leg LMFBR components, 12:15852 (RA;US)
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)
Reactor Core Disruption
Experimental and theoretical investigation of a phase-change front-prediction method, 12:16136 (J;US)
Reactor Cores
Safety aspects of LMR [liquid metal-cooled reactor] core design, 12:16015 (R;US)
Transient bowing of core assemblies in advanced liquid metal fast reactors, 12:15846 (R;US)
Reactor Materials
Comparison of material property specifications of austenitic steels in fast breeder reactor technology, 12:16273 (R;FR)
Reactor Safety Experiments
Experimental and theoretical investigation of a phase-change front-prediction method, 12:16136 (J;US)
Safety
Safety aspects of LMR [liquid metal-cooled reactor] core design, 12:16015 (R;US)
Sodium
Advances in sodium technology, testing and diagnostics of fast reactors, 12:15856 (R;CS;In Czech and Russian)

LNG
See LIQUEFIED NATURAL GAS

LNG PLANTS
Capitalized Cost
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)

LOAD ANALYSIS
L Codes
Load modeling for power flow and transient stability computer studies: Volume 1, Summary report: Final report, 12:16174 (R;US)

LOAD CHARACTERISTICS
See LOAD ANALYSIS

LOAD MANAGEMENT
Determining the extent, benefits, cost, and timing of utility conservation and load management programs, 12:16173 (R;US)

LOANS
See FINANCIAL ASSISTANCE

LOCA
See LOSS OF COOLANT

LOCAL GOVERNMENT
Air Pollution Monitoring
Precision and accuracy assessments for state and local air-monitoring networks, 1984, 12:16720 (R;US)

LOCAL GROUP
See GALAXIES

LOFT REACTOR
Reactor Safety Experiments
Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)

LONGWALL MINING
Powered Supports
System for automatic monitoring of longwall supports at Angus Place colliery, 12:15321 (R;AU)

LORENTZ FORCE
Convection
Convection-driven dynamos, 12:16943 (RA;CS)

LOS ALAMOS SCIENTIFIC LABORATORY
See LASL

LOSS OF COOLANT
Computerized Simulation
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
PKL, 12:16008 (R;FR;In French)
Fission Product Release
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
TREAT source-term experiment STEP-1 simulating a PWR LOCA, 12:16106 (J;US)
Heat Transfer
Assessment of the heat transfer models in the TRACB02 code, 12:16138 (J;US)
BWR/6 DBA analysis with limited ECC, 12:16090 (J;US)
Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2, 12:16087 (J;US)
Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident, 12:16086 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Model for stratified flow in a CANDU reactor header manifold, 12:16137 (J;US)
Modifications and assessment of rewetting correlations for light water reactor system analysis, 12:16134 (J;US)
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)
Hydraulics
Assessment of the heat transfer models in the TRACB02 code, 12:16138 (J;US)
BWR/6 DBA analysis with limited ECC, 12:16090 (J;US)
Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2, 12:16087 (J;US)
Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident, 12:16086 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Model for stratified flow in a CANDU reactor header manifold, 12:16137 (J;US)
Modifications and assessment of rewetting correlations for light water reactor system analysis, 12:16134 (J;US)
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)

R Codes
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Reactor Safety Experiments
PKL, 12:16008 (R;FR;In French)
Regression Analysis
LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique, 12:16096 (J;US)
Sensitivity Analysis
LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique, 12:16096 (J;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Two-Phase Flow
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)

LOSS OF FLUID TEST REACTOR
See LOFT REACTOR

LOTUS FACILITY
Computerized Simulation
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
Research Programs
Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)
The LBM program at the EPFL/LOTUS Facility, 12:17524 (J;US)
The neutronic analysis for the LBM/LOTUS experiment, 12:17525 (J;US)
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)

LOW FLUX REACTOR PETTEN
See LFR REACTOR

LOW-LEVEL RADIOACTIVE WASTES
Classification
Cost effectiveness of below-threshold waste disposal at DOE sites, 12:15465 (J;US)
Defining greater-than-class-C low-level radioactive waste, 12:15453 (J;US)
Disposal of BRC wastes containing short-lived radionuclides, 12:15457 (J;US)
Evaluation
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Ground Disposal
Site characterization field manual for near surface geologic disposal of low-level radioactive waste, 12:15422 (R;US)
Inventories
The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
Liquid Wastes
Alternative low-level waste processing techniques, 12:15467 (J;US)
Operating a transportable volume reduction and solidification system (TVR-III), 12:15468 (J;US)
Prediction of critical grout parameters: critical flow rate, 12:15469 (J;US)
Radiation Hazards
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Radioactive Waste Disposal
Approach to defining de minimis, intermediate, and other classes of radioactive waste, 12:15459 (J;US)
Cost effectiveness for improved methods of low-level radioactive waste disposal, 12:15463 (J;US)
Cost effectiveness of below-threshold waste disposal at DOE sites, 12:15465 (J;US)
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Defining greater-than-class-C low-level radioactive waste, 12:15453 (J;US)
Disposal of slightly contaminated radioactive wastes from nuclear power plants, 12:15540 (RA;US)
Disposal of BRC wastes containing short-lived radionuclides, 12:15457 (J;US)
Economic considerations for nuclear power plant LLW, 12:15464 (J;US)
Economics of disposal at future disposal facilities, 12:15460 (J;US)
Effect of technology on the economics of low-level waste disposal, 12:15461 (J;US)
Evaluation of the potential for deregulated disposal of very low level wastes from nuclear power plants, 12:15455 (J;US)
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)
Feasibility of centralizing disposal and processing facilities for low-level biomedical waste, 12:15541 (RA;US)
Modeling the economics of LLW volume reduction, 12:15462 (J;US)
Northrop Triga facility decommissioning plan versus actual results, 12:16066 (J;US)
Proposed classification scheme for high-level and other radioactive wastes, 12:15458 (J;US)
Standard format and content of a license application for a low-level radioactive waste disposal facility: Safety analysis report, 12:15435 (R;US)
Radioactive Waste Management
Problems of interpretation in implementing the low-level waste act, 12:15470 (J;US)
Radioactive Waste Processing
Alternative low-level waste processing techniques, 12:15467 (J;US)
Economic considerations for nuclear power plant LLW, 12:15464 (J;US)
Low and medium level liquid waste processing at the new La Hague reprocessing plant, 12:15411 (R;FR;In French)
Prediction of critical grout parameters: critical flow rate, 12:15469 (J;US)
Radioactivity
Disposal of slightly contaminated radioactive wastes from nuclear power plants, 12:15540 (RA;US)
Using a HPGe detector and micro R meter for quick and simple estimate of radionuclide activity in LSA shipping containers, 12:15531 (RA;US)
Regulations
Criteria for waste-related risks to be below regulatory concern, 12:15456 (J;US)
Problems of interpretation in implementing the low-level waste act, 12:15470 (J;US)
Sludges
Prediction of critical grout parameters: critical flow rate, 12:15469 (J;US)
Solidification
Operating a transportable volume reduction and solidification system (TVR-III), 12:15468 (J;US)
Quality assurance consideration for cement-based grout technology programs at Oak Ridge National Laboratory, 12:15414 (R;US)
Underground Disposal
Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
Volume
Modeling the economics of LLW volume reduction, 12:15462 (J;US)

LP-GAS
See LIQUEFIED PETROLEUM GASES

LUCIE-2 REACTOR
Reactor Cooling Systems
Vibration monitoring/diagnostic techniques, as applied to reactor coolant pumps, 12:15823 (J;US)

LUNGS
Adenomas
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)

Biological Radiation Effects
Neptunium-237 inhalation in rats, 12:16880 (J;US)
Carcinomas
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)
Neoplasms
Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
Responses of the respiratory tract to inhaled particle-organic mixtures, 12:16893 (RA;US)
Sensitivity
Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)

LWBR TYPE REACTORS
Fuel Pellets
In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)
Reactor Cores
Qualification of an LWBR-irradiated fuel assay gauge, 12:15864 (J;US)

LWGR TYPE REACTORS
See also CHERNOBYLSK-1 REACTOR
CHERNOBYLSK-4 REACTOR
N-REACTOR
Data
Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)
Safety
Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)

LWR TYPE REACTORS
See WATER COOLED REACTORS

LYMPHOCYTES
DNA Repair
Levels of uracil DNA glycosylase and AP endonuclease in murine B- and T-lymphocytes do not change with age, 12:16798 (J;CH)
Gene Mutations
Human lymphocyte mutagenicity assay, 12:16898 (RA;US)

LYMPHOID CELLS
See LYMPHOCYTES

M

MA 754
See NICKEL BASE ALLOYS

MA 956
See IRON BASE ALLOYS

MACACA
See MACACUS

MACACUS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)

MACERALS
Dissolution
Mild oxidative solubilization of coal macerals, 12:15300 (R;US)
Structural Chemical Analysis
Mild oxidative solubilization of coal macerals, 12:15300 (R;US)

MAGMA
Cobalt
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Nickel
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)

MAGMA SYSTEMS
Heat Recovery
Magma energy extraction, 12:15630 (R;US)

MAGNESIUM
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)

MAGNESIUM 24 REACTIONS
Elastic Scattering
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Incomplete Fusion Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)

MAGNESIUM 24 TARGET
Magnesium 24 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
Neutron Reactions
Neutron scattering on light even-even nuclei, 12:17214 (RA;CS)
Sulfur 32 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)

MAGNESIUM ALLOYS
X-Ray Spectra
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)

MAGNESIUM OXIDES
Absorption Spectroscopy
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Breakdown
Electrolytic coloration and electrical breakdown of MgO single crystals, 12:16343 (J;US)
Coloration
Electrolytic coloration and electrical breakdown of MgO single crystals, 12:16343 (J;US)
Crystal Defects
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Impurities
Electrolytic coloration and electrical breakdown of MgO single crystals, 12:16343 (J;US)
Mechanical Properties
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Microstructure
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)

MAGNET COILS
Composite Materials
System studies of Compact Ignition Tokamaks, 12:17535 (J;US)
Cooling
Liquid nitrogen cooling considerations of the Compact Ignition Tokamak, 12:17486 (R;US)
Design
Critical field index for passive coil stabilization of the shift instability, 12:17458 (RA;US)

MAGNETIC BREMSSTRAHLUNG
See SYNCHROTRON RADIATION

MAGNETIC COILS
See MAGNET COILS

MAGNETIC MONOPOLES
Magnetic monopoles: from classical to quantum physics, 12:17154 (R;FR)
Cosmology
Monopole abundance from first order GUT phase transition of the early Universe, 12:16961 (R;HU)

Unified Gauge Models
Monopole abundance from first order GUT phase transition of the early Universe, 12:16961 (R;HU)
MAGNETIC SHIELDING
Neutron Leakage
Study of neutron leakage through an Fe shield at an accelerator, 12:16517 (J;US)
MAGNETIC SPECTROMETERS
Calibration
EhLEKTRON magnetic spectrometer calibration, 12:16605 (R;SU;In Russian)
MAGNETIC STORMS
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
MAGNETOHYDRODYNAMIC GENERATORS
See MHD GENERATORS
MAGNETOHYDRODYNAMICS
Convection
Magnetoconvection, 12:17090 (RA;CS)
Turbulence
Magnetohydrodynamic turbulence, 12:17089 (RA;CS)
MAGNETOPAUSE
Stability
Magnetopause stability threshold for patchy reconnection, 12:16949 (RA;CS)
MAHOGANY TREES
See TREES
MALIGNANCIES
See NEOPLASMS
MAMMARY GLANDS
Neoplasms
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)
NMR Imaging
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)
MAN
All of mankind, of any age or of either sex.
Behavior
Ventilation and occupant behavior in two apartment buildings, 12:16203 (R;US)
MANGANESE
Emission Spectroscopy
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Oxidation
Studies on manganese oxidizing spore forming bacteria, 12:16839 (RA;US)
MANGANESE 55
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
MANGANESE ALLOYS
X-Ray Spectra
Soft x-ray emission studies of several aluminum alloys, 12:16293 (R;US)
MANGANESE SULFATES
Calibration Standards
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
MANGANESE TELLURIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
MANHATTAN PROJECT
Historical Aspects
Hanford defense mission: Past, present and future, 12:17631 (R;US)
MANIPULATORS
Comparative Evaluations
Manipulator comparative testing program, 12:16453 (J;US)
Computer Graphics
Interactive animated displayed of man-controlled and autonomous robots, 12:16459 (J;US)
MANUFACTURING FACILITIES
See INDUSTRIAL PLANTS
MANY-BODY PROBLEM
See also FOUR-BODY PROBLEM
THREE-BODY PROBLEM
TWO-BODY PROBLEM
Monte Carlo Method
Variational Monte Carlo calculations of few-body nuclei, 12:17206 (R;US)
Reviews
[International conference and symposium on unified concepts of many-body problems]: Symposium summary, 12:17298 (R;US)
MAPLES
Photosynthesis
Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)
MARINE DISPOSAL
Simulation
Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
MARINE VEHICLE ACCIDENTS
See ACCIDENTS
MARS PLANET
Brightness
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Carbon Dioxide
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Carbon Monoxide
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Microwave Spectra
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Oxygen
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Planetary Atmospheres
Advanced infrared astronomy, 12:16971 (RA;US)
Water Vapor
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
MARS REACTOR
Breeding Blankets
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
MARSHES
Bacteria
Feeding relationships of harpacticoid copepods and microbial flora in a salt marsh, 12:16827 (RA;US)
MASERS
Microwave Amplification by Stimulated Emission of Radiation.

Radiation Sources
High power, millimeter-wavelength, coherent radiation sources. Final report, 1 February 1982-31 January 1986, 12:16487 (R;US)

MASKS
See RESPIRATORS

MASS SPECTROSCOPY
Time-of-Flight Spectrometers
Double-arm time-of-flight spectrometer for the DEMAS installation, 12:16629 (R;SU;In Russian)

MASS TRANSIT SYSTEMS
Economic Analysis
National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983, 12:16210 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report, 12:16211 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement, 12:16212 (R;US)
National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980, 12:16213 (R;US)
National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982, 12:16214 (R;US)
Energy Consumption
National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983, 12:16210 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report, 12:16211 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement, 12:16212 (R;US)
National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980, 12:16213 (R;US)
National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982, 12:16214 (R;US)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY ALC
See ALCATOR DEVICE

MATERIALS (ANTIFERROMAGNETIC)
See ANTIFERROMAGNETIC MATERIALS

MATERIALS (BIOLOGICAL)
See BIOLOGICAL MATERIALS

MATERIALS (BUILDING)
See BUILDING MATERIALS

MATERIALS (COMPOSITE)
See COMPOSITE MATERIALS

MATERIALS (ENVIRONMENTAL)
See ENVIRONMENTAL MATERIALS

MATERIALS HANDLING EQUIPMENT
See also CRANES
REMOTE HANDLING EQUIPMENT
Dusts
Measurement of fugitive emissions in a coal-fired power plant, 12:15753 (RA;US)

MATERIALS (SEMICONDUCTOR)
See SEMICONDUCTOR MATERIALS

MATERIALS (SHIELDING)
See SHIELDING MATERIALS

MATHEMATICAL MANIFOLDS
See also COMPLEX MANIFOLDS
Metrics
Kaehler-Einstein invariant metrics on compact homogeneous manifolds, 12:17366 (R;SU;In Russian)

MATHEMATICAL MODELS
See also ATOMIC MODELS
CLIMATE MODELS
COSMOLOGICAL MODELS
FLOW MODELS
GENERAL CIRCULATION MODELS
MOLECULAR MODELS
NUCLEAR MODELS
STAR MODELS
STATISTICAL MODELS
Monte Carlo Method
Hybrid Monte Carlo/analytical model of neutron coincidence counting, 12:16665 (J;US)

MATRICES
Algorithms
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
Parallel Processing
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)

MAXWELL-BOLTZMANN EQUATION
See BOLTZMANN EQUATION

MC GUIRE-1 REACTOR
Cornelius, North Carolina, USA
Fuel Management
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)
Spent Fuel Storage
Extended burnup: ex-core and accident considerations, 12:15807 (J;US)

MCPP
See DUAL-PURPOSE POWER PLANTS

MEASURE THEORY
Quantum Operators
Joint distributions of observables and measures with infinite values, 12:17376 (R;SU)

MEASURING INSTRUMENTS
Use of a more specific term is recommended.
See also ANEMOMETERS
DOSEMETERS
MOISTURE GAGES
PHOTOMETERS
POROSIMETERS
RADIATION DETECTORS
RANGE FINDERS
SPECTROMETERS
THICKNESS GAGES
VELOCIMETERS
WEIGHT INDICATORS
Control Systems
Fundamental data analyses for measurement control, 12:15564 (R;US)

MECHANICAL ENGINEERING
Meetings
Recent experiences in multidisciplinary analysis and optimization, part 1, 12:16437 (R;US)

MECHANICAL STRUCTURES
Deformation
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
Mechanical Vibrations
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
Stress Analysis
Residual effects in laminated, curved, composite panels, 12:16236 (R;US)

MECHANICAL VIBRATIONS
Computer Codes
User manual for BUNVIS-RG: an exact buckling and vibration program for lattice structures, with repetitive geometry and substructuring options, 12:16444 (R;US)
Monitoring
Detection of incipient failure in vertical pumps, 12:15687 (RA;US)

Evaluation of alternative techniques for machinery vibration monitoring, 12:15684 (RA;US)
Laser doppler measurement of torsional vibrations, 12:15705 (RA;US)
Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)
On-line vibration monitoring at the United Illuminating Company, 12:15691 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Start-up support and trouble shooting for multi-bearing machine, 12:15686 (RA;US)
Turbine supervisory instrumentation, 12:15692 (RA;US)
Vibration signature analysis at Philadelphia Electric, 12:15690 (RA;US)

MEETINGS
Atomic physics 9, 12:17085 (B;SG)
Photon emission from irradiated solids: Proceedings of the Werner Brandt workshop on penetration phenomena, 12:17338 (R;US)

MELANOCYTES
See ANIMAL CELLS

MELUSINE-2 REACTOR
See SILOETTE REACTOR

MEMBER STATES
Countries participating in an international organization.
International Cooperation
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)
Nuclear Power
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)

MEMORY DEVICES
Data Processing
Memory division module MDP.2, 12:16671 (R;SU;In Russian)
Efficiency
The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)
System Failure Analysis
The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)

MERCURY
Detection
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)
Photoemission
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)

MERCURY CHLORIDES
Carcinogen Screening
Toxicokinetics of model compounds, 12:16888 (RA;US)

MESH GENERATION
Mathematical Operators
A diffusion operator for Lagrangian meshes, 12:17659 (R;US)

MESOCRICETUS
See HAMSTERS

MESON FACTORIES
The TRIUMF kaon factory proposal, 12:16569 (R;CA)

MESON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET

MESSENGER-RNA
Biochemical Reaction Kinetics
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)

METAGALAXY
See UNIVERSE

METAL INDUSTRY
Energy Conservation
Roles of electricity: Electric steelmaking, 12:16220 (R;US)
Hazardous Materials
Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon (2-ethoxyethanol), 12:16713 (R;US)

METALLIC GLASSES
Corrosion Resistance
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Ion Implantation
Passivation of P-implanted Fe-Cr amorphous alloys, 12:16297 (R;US)
Passivation
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)

METALS
See also ALKALI METALS
ALUMINIUM
ANTIMONY
BISMUTH
CADMIUM
GALLIUM
GERMANIUM
LEAD
LIQUID METALS
MERCURY
REFRACTORY METALS
SCRAP METALS
TRANSITION ELEMENTS
ZINC
Corrosion Resistance
The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
Grain Boundaries
Computer simulation of "special" grain boundaries in metals and ionic materials, 12:16247 (R;US)
Ion Implantation
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
Physical Radiation Effects
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
Quantitative Chemical Analysis
Studies on heavy metals in household refuse and on heavy metals concentration in certain fractions or groups of materials by suitable treatment, 12:16774 (R;DE;In German)
Rolling
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)
Texture
The effect of the cube texture component on the earing behavior of rolled f.c.c. metals, 12:16283 (R;US)

METEORITES
See also IRON METEORITES
Chemical Composition
Antarctic meteorite newsletter, volume 9, number 1, 12:17029 (R;US)
Infrared Spectra
Physical properties of asteroids, 12:17015 (RA;US)
Petrology
Antarctic meteorite newsletter, volume 9, number 1, 12:17029 (R;US)

METEOROLOGY
Diffusion
Evaluation of tetroon flights and turbulent diffusion under weak wind conditions during the field experiment SIESTA, 12:16688 (R;DE)
Influence of stability classification on atmospheric diffusion calculations for elevated releases over a terrain of major roughness, 12:16687 (R;DE)
Information Systems
Design and use of climatological data banks, with emphasis on the preparation and homogenization of surface monthly records, 12:16772 (J;NL)

METER WAVE RADIATION
See RADIOWAVE RADIATION
METHANE
Adsorption
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Biosynthesis
Development of an advanced anaerobic digester design and a kinetic model for biogasification of water hyacinth/sludge blends, 12:15585 (R;US)
Chemical Reaction Yield
Recent developments in wet carbonization of peat, 12:15274 (R;US)
Combustion Kinetics
Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Ecological Concentration
Core processing and first analysis of ice cores from Siple and South Pole stations, 12:16767 (J;US)
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
Environmental Effects
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
Ignition
Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)
Mixing
Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)
High-resolution coherent anti-Stokes Raman spectroscopy measurements of carbon monoxide linewidths in a flame, 12:15370 (BA;US)
Spectroscopy
HALOE science investigation. Semiannual progress report, February-July 1986, 12:16705 (R;US)
METHANOL
Production
Methanol production from indigenous resources in New York State, 12:15591 (R;US)
Methanol production from indigenous resources in New York State. Volume 1. Executive summary, 12:15592 (R;US)
Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants, 12:15593 (R;US)
Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants, 12:15594 (R;US)
Synthesis
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
METHANOL FUELS
Pure methanol, methanol-water mixtures, or methanol with additives; for methanol-gasoline mixtures, use GASOHOL.
Production
Methanol production from indigenous resources in New York State, 12:15591 (R;US)
Methanol production from indigenous resources in New York State. Volume 1. Executive summary, 12:15592 (R;US)
Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants, 12:15593 (R;US)
Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants, 12:15594 (R;US)
METHANOL PLANTS
Capitalized Cost
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
Chemical Feedstocks
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
Design
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
METHYL ALCOHOL
See METHANOL
METHYL VIOLOGEN
See BIPYRIDINES
METHYLBENZENE
See TOLUENE
METHYL-FUEL
See METHANOL
METROPOLITAN AREAS
See URBAN AREAS
MEXICO
Nuclear Power
Retrospective economic and financial analysis of the Laguna Verde Project, 12:15892 (RA;XA)
Wind Power
A low cost and easy to reproduce anemometer for basic wind data acquisition, 12:15633 (BA;US)
MFTF DEVICES
Prior to October 1977, MX DEVICES was used to index this concept.
Computerized Control Systems
The operator interface for the Mirror Fusion Test Facility, 12:17489 (R;US)
Data Acquisition Systems
The operator interface for the Mirror Fusion Test Facility, 12:17489 (R;US)
Reviews
Energy and Technology Review, November 1986, 12:17488 (R;US)
Superconducting Magnets
Stability and vibration of internal windings of superconducting solenoid magnets, 12:17610 (J;US)
MHD GENERATORS
See also LIQUID-METAL MHD GENERATORS
OPEN-CYCLE MHD GENERATORS
Design
Space-based laser-driven MHD generator: feasibility study. Final report, 12:16187 (R;US)
Electromagnets
Two dimensional analysis for magnetic flux distribution in electromagnet used for MHD applications, 12:17086 (R;IN)
Mathematical Models
Space-based laser-driven MHD generator: feasibility study. Final report, 12:16187 (R;US)
Performance
In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Physical Radiation Effects
In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Test Facilities
Testing and evaluation of heat recovery/seed recovery: Annual technical progress report, april 1981-March 1982, 12:16186 (R;US)
MICE
Hypertension
Some factors affecting the uptake of iodoamphetamine (IAMP), 12:16824 (J;US)
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)

Oogenesis
DNA synthesis studies in pre-meiotic mouse oogenesis, 12:16842 (J;CH)
MICELLAR-POLYMER FLOODING
See MICROEMULSION FLOODING
MICHIGAN
Fossil-Fuel Power Plants
Experience with water chemistry control in cycling units at Detroit Edison, 12:15732 (RA;US)
MICROBIAL ENHANCED OIL RECOVERY
See MICROBIAL EOR
MICROBIAL EOR
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Environmental Impacts
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
MICROBIAL PROCESSES
See BIODEGRADATION
MICROCOMPUTERS
See MICROPROCESSORS
MICRODOSIMETRY
Biological Models
Implementation of microdosimetry codes on mini-computers, 12:16872 (RA;US)
Mathematical Models
Averaging dose in inhomogeneously irradiated tissue, 12:17332 (RA;US)
MICROEMULSION FLOODING
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Field Tests
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Sweep Efficiency
Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)
MICROPROCESSORS
Data Transmission
Micro-to-Mainframe Communication Standard: Subsystem design analysis report, 12:17658 (R;US)
Specifications
Versatile Data Processing Unit (DPU) for satellite-borne composition instrumentation, 12:16939 (RA;US)
MICROSCOPY
See also ELECTRON MICROSCOPY
ION MICROSCOPY
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
MICROSOMES
Proton Transport
Auxin regulation of a proton translocating ATPase in pea root plasma membrane vesicles (Pisum sativum. L.), 12:16808 (J;US)
MICROWAVE EQUIPMENT
See also SQUID DEVICES
Cathodes
Observation of high-power microwave emission from a virtual cathode device, 12:16497 (BA;US)
MICROWAVE RADIATION
Production
Observation of high-power microwave emission from a virtual cathode device, 12:16497 (BA;US)
MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION
MILITARY FACILITIES
Waste Management
Hazardous-waste management: a descriptive study. Master's thesis, 12:16156 (R;US)
MILL TAILINGS
Radioactive Waste Management
Scientific basis for risk assessment and management of uranium mill tailings, 12:15560 (R;US)
Remedial Action
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 2, Appendices, 12:15562 (R;US)
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 1, Text, 12:15561 (R;US)
Risk Assessment
Scientific basis for risk assessment and management of uranium mill tailings, 12:15560 (R;US)
MINE ROADWAYS
Mathematical Models
Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)
Stability
Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)
MINE-MOUTH GENERATING PLANTS
See FOSSIL-FUEL POWER PLANTS
MINIMARS REACTOR
Breeding Blankets
A thin LiPb/Be helium cooled blanket for MINIMARS: Neutronics analysis, 12:17596 (J;US)
Helium-cooled, FLiBe-breeder, beryllium-multiplier blanket for MINIMARS, 12:17513 (J;US)
The chemistry of molten Li/sub 2/BeF/sub 4/, 12:17581 (J;US)
Thin blanket design for MINIMARS - A compact tandem mirror fusion reactor, 12:17511 (J;US)
Cost Estimation
The final version of MINIMARS--An engineering view, 12:17501 (J;US)
Design
The final version of MINIMARS--An engineering view, 12:17501 (J;US)
Direct Energy Converters
Direct converter design for the MINIMARS Tandem Mirror Reactor, 12:17555 (J;US)
Engineering
The final version of MINIMARS--An engineering view, 12:17501 (J;US)
Superconducting Magnets
MINIMARS choke coil design, 12:17607 (J;US)
MINING EQUIPMENT
Surveys
Surface and underground coal-mine-equipment population, 1982. Information Circular/1986, 12:15322 (R;US)
MINNESOTA
Radioactive Waste Facilities
Crystalline Repository Project: Review and comment of the Leech Lake Reservation Business Committee: Draft area recommendation report, 12:15420 (R;US)
Draft area recommendation report for the Crystalline Repository Project: Comments: Final technical report, 12:15419 (R;US)
MIRROR ADVANCED REACTOR STUDY
See MARS REACTOR
MIRROR FUSION TEST FACILITY
See MFTF DEVICES
MIRRORS
Erosion
Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)
Oxidation
Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)

MISSILE PROTECTION
Computer Codes
Hypercube tracking: A preliminary status report, 12:16682 (R;US)
MIXED OXIDE FUELS
Uranium dioxide mixed with other oxides.
Fuel-Cladding Interactions
Fuel/cladding chemical interaction correlation for mixed-oxide fuel pins, 12:15957 (J;US)
Performance
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
S Codes
SIEX3: A correlated computer code for prediction of fast reactor mixed oxide fuel and blanket pin performance, 12:15854 (R;US)
MOBILITY
Not for material movement; see also TRANSPORT.
Control
Improved CO_2 enhanced oil recovery mobility control by in-situ chemical precipitation: Annual report for the period September 1985 to September 1986, 12:15355 (R;US)
MODELS (ATOMIC)
See ATOMIC MODELS
MODELS (COSMOLOGICAL)
See COSMOLOGICAL MODELS
MODELS (FLOW)
See FLOW MODELS
MODELS (MATHEMATICAL)
See MATHEMATICAL MODELS
MODELS (NUCLEAR)
See NUCLEAR MODELS
MODELS (STAR)
See STAR MODELS
MODELS (STATISTICAL)
See STATISTICAL MODELS
MODULAR COGENERATION POWER PLANTS
See DUAL-PURPOSE POWER PLANTS
MOISTURE GAGES
Fiber Optics
Fiber optic moisture sensor with moisture-absorbing reflective target, 12:16677 (P;US)
MOLECULAR MODELS
Symmetry
Dynamic symmetries in nuclei and molecules, 12:17263 (RA;CS)
MOLECULAR ORBITAL MODEL
See ATOMIC MODELS
MOLECULES
MOLECULAR SIEVES
Performance Testing
Residual tritiated water in molecular sieves, 12:17545 (J;US)
MOLECULAR STRUCTURE
Reviews
Proximity effect in molecular photophysics: dynamical consequences of Pseudo-Jahn-Teller interaction, 12:16426 (J;US)
MOLECULE COLLISIONS
See also ATOM-MOLECULE COLLISIONS
ELECTRON-MOLECULE COLLISIONS
ION-MOLECULE COLLISIONS
MOLECULE-MOLECULE COLLISIONS
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
Inelastic Scattering
Rotational energy transfer in molecule-molecule and molecule-surface collisions, 12:17076 (RA;CS)
MOLECULE-MOLECULE COLLISIONS
Inelastic Scattering
Rotational energy transfer in molecule-molecule and molecule-surface collisions, 12:17076 (RA;CS)
Time of flight experiments of the and H/sup +/ scattered from molecules and solid surfaces, 12:17072 (RA;CS)
MOLECULES
Van der Waals Forces
Dissociation dynamics of van der Waals molecules, 12:17074 (RA;CS)
MOLTEN CARBONATE FUEL CELLS
Prior to June 1980 this information was indexed with the descriptors HIGH-TEMPERATURE FUEL CELLS + MOLTEN SALTS + CARBONATES.
Cathodes
Investigation of alternative MCFC cathode materials at Argonne National Laboratory, 12:16196 (BA;US)
Progress on molten carbonate fuel cell alternative cathodes ($LiFeO_2$; Li_2MnO_3), 12:16189 (R;US)
Chemical Effluents
Interaction of trace species with the molten carbonate fuel cell: Task report No. 12, 12:16193 (R;US)
Electric Conductivity
Investigation of alternative MCFC cathode materials at Argonne National Laboratory, 12:16196 (BA;US)
Fuels
Development of a hot gas cleanup system for integrated coal gasification/molten carbonate fuel cell power plants, 12:15270 (R;US)
Materials Testing
Electronic defects in $LiFeO_2$, 12:16190 (R;US)
Service Life
Investigation of alternative MCFC cathode materials at Argonne National Laboratory, 12:16196 (BA;US)
Testing
Investigation of alternative MCFC cathode materials at Argonne National Laboratory, 12:16196 (BA;US)
MOLTEN SALT COOLANTS
See MOLTEN SALTS
MOLTEN SALT REACTORS
Thermosyphons
Experimental investigation of closed-type convective thermosyphon thermal performance as applied to a molten salt power reactor, 12:15836 (R;SU;In Russian)
MOLTEN SALTS
See also FLIBE
Chlorination
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts ($CaCl_2$. CaO salt), 12:16282 (R;US)
MOLYBDENUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Neutron Transport
Investigation of time evolution of leakage neutron spectra from the surface of a molybdenum sphere in the nanosecond range, 12:17309 (R;SU;In Russian)
Solubility
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
MOLYBDENUM ALLOYS
See also HASTELLOYS
INCONEL 718
MOLYBDENUM BASE ALLOYS
STAINLESS STEEL-316
Corrosion Resistance
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Crystal Growth
Primary arm spacing in chill block melt spun Ni-Mo alloys, 12:16288 (R;US)
MOLYBDENUM BASE ALLOYS
Quantitative Chemical Analysis
Spectrographic determination of boron in Mo-B microalloys, 12:16380 (R;IN)

MOLYBDENUM BROMIDES
Binding Energy
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Crystal Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Electronic Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Vibrational States
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
MOLYBDENUM CHLORIDES
Binding Energy
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Electronic Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Vibrational States
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
MOLYBDENUM IODIDES
Binding Energy
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Crystal Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Electronic Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Vibrational States
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
MOLYBDENUM OXIDES
Crystal Structure
Further aspects of the structure and magnetism of the layered compound Fe(III)$ClMoO_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
Magnetic Susceptibility
Further aspects of the structure and magnetism of the layered compound Fe(III)$ClMoO_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
MONAZITES
Nuclear Reaction Analysis
Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)
MONGRELS
See DOGS
MONITORED RETRIEVABLE STORAGE
Radiation Doses
Radiation doses in alternative commercial high-level waste management systems, 12:15466 (J;US)
MONITORS (RADIATION)
See RADIATION MONITORS
MONITORS (REACTOR)
See REACTOR CONTROL SYSTEMS
MONOCHLOROETHYLENE
See VINYL CHLORIDE
MONOCHROMATORS
Design
Monochromator wavelength measurement device with six figure accuracy, 12:16471 (BA;US)
MONOCLONAL ANTIBODIES
Chemical Reactions
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Labelling
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
MONOCRYSTALS
Photon Beams
Nuclear-optical methods for production of polarized photons with energies of a few hundred GeV, 12:17306 (R;SU)
MT ST HELENS
Volcanic Gases
Evaluation of gas data from high-temperature fumaroles at Mount St. Helens, 1980-1982, 12:16740 (J;NL)
MULTICHARGED IONS
Ions with charge 3 and above. Coordinate the above descriptor with a descriptor for the specific ion.
Ion Sources
Atomic physics and synchrotron radiation: The production and accumulation of highly charged ions, 12:17058 (R;US)
MULTIPLE PRODUCTION
Jet Model
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
MULTIPROCESSING
See PARALLEL PROCESSING
MULTIPROCESSORS
See ARRAY PROCESSORS
MULTIWIRE DRIFT CHAMBERS
See DRIFT CHAMBERS
MULTIWIRE PROPORTIONAL CHAMBERS
See also DRIFT CHAMBERS
Aging
Review of wire chamber aging, 12:16656 (J;NL)
Dielectric Materials
Time and amplitude characteristics of multiwire detectors, 12:16608 (R;SU;In Russian)
Reviews
Review of wire chamber aging, 12:16656 (J;NL)
Time Resolution
Time and amplitude characteristics of multiwire detectors, 12:16608 (R;SU;In Russian)
Uses
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 12:16652 (J;NL)

MUNICIPAL WASTES
Combustion
Arguments against energy from waste, 12:16489 (RA;DE;In German)
Energy from waste: Is it ecologically acceptable, 12:16488 (RA;DE;In German)
Is waste incineration feasible. Result of experts' discussion on a waste management concept for the south western and southern Palatinate. 2. Ed. , 12:16225 (R;DE;In German)
Technical requirements on refuse-fuelled heat- and-power plants, 12:15669 (RA;DE;In German)
Economics
Arguments against energy from waste, 12:16489 (RA;DE;In German)
Materials Recovery
Arguments against energy from waste, 12:16489 (RA;DE;In German)
Sorting
Studies on heavy metals in household refuse and on heavy metals concentration in certain fractions or groups of materials by suitable treatment, 12:16774 (R;DE;In German)
Waste Management
Is waste incineration feasible. Result of experts' discussion on a waste management concept for the south western and southern Palatinate. 2. Ed. , 12:16225 (R;DE;In German)
Waste Processing
Energy from waste: Is it ecologically acceptable, 12:16488 (RA;DE;In German)
Pyrolysis and dumping: Are they alternatives to waste incineration, 12:16498 (RA;DE;In German)
Waste management concept for the south western and southern Palatinate, 12:16226 (RA;DE;In German)
MUON BEAMS
Beam Production
Neutrino physics at future colliders, 12:17109 (RA;CS)
MUON REACTIONS
Capture
Measurement of the muon capture rate in liquid deuterium by the lifetime technique, 12:17204 (R;FR)
Thermonuclear Reactions
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
MUON-PROTON INTERACTIONS
Cross Sections
Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering, 12:17152 (R;SU;In Russian)
Deep Inelastic Scattering
Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering, 12:17152 (R;SU;In Russian)
Radiative Corrections
Electromagnetic corrections to elastic radiative tail in deep inelastic lepton-nucleon scattering, 12:17152 (R;SU;In Russian)
MUTATIONS
Radioinduction
Alpha-particle dose distribution effects at the cellular level, 12:16871 (RA;US)
Mechanism of mutagen-induced deoxynucleoside triphosphate imbalance in Chinese hamster ovary (CHO-K1) cells, 12:16869 (RA;US)
Stochastic repair-misrepair model, 12:16870 (RA;US)
MWPC
See MULTIWIRE PROPORTIONAL CHAMBERS
MX DEVICES
See MFTF DEVICES

N

N-1990 RESONANCES
Hadronic Particle Decay
A-dependence of production cross section of the Nsub(PHI) narrow baryon resonance, 12:17118 (R;SU;In Russian)
Particle Production
A-dependence of production cross section of the Nsub(PHI) narrow baryon resonance, 12:17118 (R;SU;In Russian)
NAI DETECTORS
Performance
Comparison of the response of a NaI scintillation crystal with a pressurized ionization chamber as a function of altitude, radiation level, and Ra-226 concentration, 12:15530 (RA;US)
NAL SYNCHROTRON
See FERMILAB ACCELERATOR
NATIONAL ACCELERATOR LABORATORY
See FERMILAB ACCELERATOR
NATIONAL GOVERNMENT
Use only when needed in conjunction with one or both of the terms LOCAL GOVERNMENT and STATE GOVERNMENT.
Liabilities
Nuclear weapons testing fallout: proving causation for exposure injury, 12:16163 (J;US)
NATIONAL REACTOR TESTING STATION
See IDAHO NATIONAL ENGINEERING LABORATORY
NATIONAL SYNCHROTRON LIGHT SOURCE
See NSLS
NATURAL GAS
See also LIQUEFIED NATURAL GAS
Availability
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Chemical Reactions
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
Cocombustion
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Market
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Low temperature methanol process: The next step, 12:15588 (R;US)
Meetings
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Prices
Select use of coal and natural gas in utility boilers. A manual for evaluating environmental, technical, and legal aspects: one way to overcome foreign-oil dependency, 12:15680 (R;US)
Research Programs
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Sales
Multistate EIA-857 respondent report 1984: Final report (Discrepancies between purchases and sales), 12:15366 (R;US)
NATURAL GAS DEPOSITS
Energy Source Development
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Flow Models
Continuous mixture computational algorithm of reservoir fluid phase behavior applicable for compositional reservoir simulation, 12:15364 (BA;US)
Gamma Logging
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Gamma-Gamma Logging
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)

Geology
Cenozoic fluctuations in biotic parts of the global carbon cycle, 12:15351 (BA;US)
Simulation experiments with Late Quaternary carbon storage in mid-latitude forest communities, 12:15352 (BA;US)
Geophysics
A reexamination of the tropospheric methane cycle: Geophysical implications, 12:15365 (BA;US)
Leasing
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Resistivity Logging
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)

NATURAL GAS DISTRIBUTION SYSTEMS
Economic Analysis
Applications of economic analysis in gas distribution, 12:15368 (R;US)

NATURAL GAS GATHERING SYSTEMS
See NATURAL GAS DISTRIBUTION SYSTEMS

NEA
PCOTPL
Limiting the liability of the nuclear operator, 12:16059 (R;XN;In English and French)

NEBULAE
See also PLANETARY NEBULAE
Infrared Radiation
Infrared reflection nebulae in Orion molecular cloud 2, 12:17035 (R;US)

NEGATIVE IONS
See ANIONS

NEGATONS
See ELECTRONS

NEGATRONS
See ELECTRONS

NEODYMIUM
Emission Spectroscopy
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)

NEODYMIUM 142 TARGET
Neutron Reactions
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)

NEODYMIUM 143 TARGET
Neutron Reactions
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)

NEODYMIUM 144 TARGET
Neutron Reactions
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)

NEODYMIUM LASERS
Specifications
PHEBUS: a new powerful laser facility for ICF research, 12:17430 (R;FR)

NEON
Differential Cross Sections
Double differential ionization cross sections, 12:17314 (RA;US)
Ionization
Double differential ionization cross sections, 12:17314 (RA;US)
Pion Minus Reactions
Secondary particle multiplicity in the π/sup -/Ne interactions at psub(π)=6.2 Gev/c, 12:17215 (R;SU;In Russian)

NEON 20 REACTIONS
Energy Dependence
Evolution of the fusion like process around the Fermi energy, 12:17227 (R;FR)
MeV Range 100-1000
Evolution of the fusion like process around the Fermi energy, 12:17227 (R;FR)

NEOPLASMS
See also CARCINOMAS
NMR Imaging
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)
Radioimmunotherapy
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)

NEPTUNE PLANET
Albedo
Visible phase curves of Uranus and Neptune and scattering in their atmospheres, 12:16993 (RA;US)
Brightness
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Heat Sources
Visible phase curves of Uranus and Neptune and scattering in their atmospheres, 12:16993 (RA;US)
Hydrogen
Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
Methane
Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
Infrared observations of planetary atmospheres, 12:16985 (RA;US)
Microwave Spectra
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)

NEPTUNIUM 236 TARGET
Neutron Reactions
Thermal neutron fission cross-sections of /sup 236/Np isomers, 12:17249 (RA;CS)

NEPTUNIUM 237
Ion Exchange
Recovery of /sup 238/Pu from irradiated /sup 237/Np using anion exchange method, 12:15381 (R;CN;In Chinese)
Lung Clearance
Neptunium-237 inhalation in rats, 12:16880 (J;US)
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Retention
Neptunium-237 inhalation in rats, 12:16880 (J;US)
Tissue Distribution
Neptunium-237 inhalation in rats, 12:16880 (J;US)

NEPTUNIUM OXIDES
Chemical Properties
Chemical behaviour of Np, Pu and Am in various concentrated salt solutions, 12:16429 (R;FR;In German)

NET TOKAMAK
Breeding Blankets
Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)
Composite beryllium-ceramics breeder pin elements for a gas cooled solid blanket, 12:17426 (R;FR)
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
Vacuum Systems
Development of large components for the fusion reactor vacuum circuits, 12:17427 (R;FR)

NETHERLANDS
Energy Policy
The Netherlands wind energy research and development program, 12:15656 (BA;US)
Wind Power
The Netherlands wind energy research and development program, 12:15656 (BA;US)

NEUTRALIZATION (CHEMICAL)
See PH VALUE

NEUTRAL-PARTICLE TRANSPORT
See also NEUTRON TRANSPORT
Numerical solution of transport equations with particle correction, 12:17356 (R;FR;In French)

NEUTRINO BEAMS
Beam Production
Beam dump neutrino experiments, 12:17108 (RA;CS)
Neutrino physics at future colliders, 12:17109 (RA;CS)
NEUTRINO OSCILLATION
Neutrino oscillations, 12:17134 (RA;CS)
Studying reactor antineutron oscillations with large underground detectors, 12:16596 (R;FR)
NEUTRINO REACTIONS
Inclusive Interactions
Study on the inclusive neutrino (antineutrino) interactions with nuclei at 3-30 GeV, 12:17105 (R;SU;In Russian)
NEUTRINO-NUCLEON INTERACTIONS
Study on the inclusive neutrino (antineutrino) interactions with nuclei at 3-30 GeV, 12:17105 (R;SU;In Russian)
NEUTRINOS
See also SOLAR NEUTRINOS
Astrophysics
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 1, 12:16944 (R;CS)
Galaxies
Neutrino masses and galaxy formation, 12:16953 (RA;CS)
NEUTRON ACTIVATION ANALYSIS
See ACTIVATION ANALYSIS
NEUTRON REACTIONS
NEUTRON BEAMS
Energy Spectra
Calculation of the energy spread and the average neutron energy of 14 MeV neutrons produced via the T(d,n)/sup 4/He reaction in solid Ti-T targets, 12:17312 (R;XA)
NEUTRON CAPTURE
See NEUTRON REACTIONS
NEUTRON DETECTION
Time-of-Flight Method
Progress in the detection of low energy neutrons, 12:16626 (RA;CS)
NEUTRON DETECTORS
See also ACTIVATION DETECTORS
Calibration
Calibration of neutron correlation counters by calorimetry and gamma-ray measurements, 12:16664 (J;US)
Field test and calibration of neutron coincidence counters for high-mass plutonium samples, 12:16647 (R;US)
Field Tests
Field test and calibration of neutron coincidence counters for high-mass plutonium samples, 12:16647 (R;US)
MeV Range 01-10
Progress in the detection of low energy neutrons, 12:16626 (RA;CS)
NEUTRON DIFFRACTOMETERS
Design
The Low-Q Diffractometer at the Los Alamos Neutron Scattering Center, 12:16648 (R;US)
On-Line Control Systems
Neutron diffractometer at the IBR-2 reactor. Control system for four-circle goniometer, 12:16484 (R;SU;In Russian)
NEUTRON DOSIMETRY
Monitoring radiation damage of reactor structural materials, 12:15949 (RA;CS;In Czech)
Personnel neutron dosimetry using CR-39 foils, 12:16879 (R;US)
Evaluation
Personnel neutron dosimeter evaluation and upgrade program, 12:16875 (RA;US)
Luminescent Dosemeters
Influence of different detector parameters on the neutron sensitivity of OSL-detectors, 12:16634 (R;SU)
Research Programs
Reactor physics (nuclear power plant design and operation) and in core dosimetry, 12:16620 (RA;CS;In Czech)
Sensitivity
Energy dependence of some neutron dosimeter sensitivities in the 1 eV up to 4 keV energy range, 12:16641 (R;SU;In Russian)
NEUTRON ECONOMY
See NEUTRON FLUX
NEUTRON FLUX
Monte Carlo Method
Fast neutron fluxes in pressure vessels using Monte Carlo methods, 12:15822 (J;US)
NEUTRON FLUX DENSITY
See NEUTRON FLUX
NEUTRON HEATING
See RADIATION HEATING
NEUTRON LEAKAGE
Neutron Spectra
Investigation of time evolution of leakage neutron spectra from the surface of a molybdenum sphere in the nanosecond range, 12:17309 (R;SU;In Russian)
NEUTRON MATTER
See NUCLEAR MATTER
NEUTRON MOISTURE METERS
See MOISTURE GAGES
NEUTRON MONITORS
On the possibility of using a neutron supermonitor in the ANI complex experiment, 12:16604 (R;SU;In Russian)
In Core Instruments
In core measurement and monitoring of reactor (neutron) radiation field, 12:16624 (RA;CS;In Czech)
NEUTRON REACTIONS
4th international symposium on neutron induced reactions. The abstracts of contributed papers, 12:17264 (R;CS)
Alpha Spectra
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)
Capture
Neutron capture mechanism, 12:17276 (RA;CS)
Cross Sections
Measurement and evaluation of nuclear data for nuclear power application, 12:17244 (RA;CS)
Uncertainties in scientific measurements, 12:17216 (R;US)
Data Covariances
Covariances of evaluated nuclear data based upon uncertainty information of experimental data and nuclear models, 12:17192 (R;US)
Elastic Scattering
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
Energy-Level Density
Nuclear level density from analysis of neutron spectra from (n,n') and (p,n) reactions, 12:17277 (RA;CS)
Fission
/sup 235/U(n,f) fragment mass, kinetic energy and angular distributions at energies below 6 MeV - results and interpretation, 12:17246 (RA;CS)
Energy dependence peculiarities of fragment mean kinetic energy at nuclei fission by neutrons, 12:17248 (RA;CS)
Experimental study of γ-ray emission from neutron resonance fission of /sup 235/U, 12:17250 (RA;CS)
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
Thermal neutron fission cross-sections of /sup 236/Np isomers, 12:17249 (RA;CS)
Hauser-Feshbach Theory
Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory, 12:17254 (R;CN;In Chinese)
Inelastic Scattering
Inelastic scattering cross-section of fast neutrons on 160, 162, 164 Dy, 12:17231 (RA;CS)
Measurement of inelastically scattering neutron spectra from the (n,n'γ) reaction on iron nuclei, 12:17213 (R;SU;In Russian)
Neutron scattering on light even-even nuclei, 12:17214 (RA;CS)
MeV Range 10-100
Proton-channel related analysis of 14 MeV (n,xn)-reactions, 12:17272 (RA;CS)
Multiplicity
Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)

Optical Models
Calculation of the reaction cross sections of neutrons on /sup 10/B, /sup 11/B by using optical model and Hauser-Feshbach theory, 12:17254 (R;CN;In Chinese)
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
Precompound-Nucleus Emission
Neutron-gamma coincidence calculations within the pre-equilibrium model, 12:17273 (RA;CS)
Protons
Analog giant dipole excitation in /sup 58/Ni(n,p)/sup 58/Co reaction at 17.3 MeV neutron energy, 12:17221 (RA;CS)
Research Programs
Progress report on nuclear data activities in India for the period from July 1984 to December 1985, 12:17191 (R;IN)
Scattering
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)
Three-Body Problem
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)

NEUTRON SOURCE FACILITIES
See also IPNS-I SYNCHROTRON
Neutron Beams
Calculation of the energy spread and the average neutron energy of 14 MeV neutrons produced via the T(d,n)/sup 4/He reaction in solid Ti-T targets, 12:17312 (R;XA)
Specifications
Intense neutron generator project at the Technical University Dresden, 12:16557 (RA;CS)
Recent developments in the multipurpose intense 14 MeV neutron source at Bratislava, 12:16509 (RA;CS)

NEUTRON SOURCES
Excludes reactors even when used as neutron sources.
Calibration
Californium-252 neutron calibration flux distribution by Monte Carlo simulation, 12:15579 (J;US)
Fabrication
TURF Californium facility at Oak Ridge National Laboratory, 12:15577 (J;US)

NEUTRON SPECTRA
Computer Calculations
Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 2, 12:15927 (RA;CS;In Czech)
Neutron spectrum determination with activation detectors, 12:16623 (RA;CS;In Czech)
Standardization
Reactor physics (nuclear power plant design and operation) and in core dosimetry, 12:16620 (RA;CS;In Czech)

NEUTRON SPECTROMETERS
In Core Instruments
Assessment of in core dosimetry measuring systems, 12:16621 (RA;CS;In Czech)

NEUTRON SPECTROSCOPY
Activation Detectors
Neutron spectrum determination with activation detectors, 12:16623 (RA;CS;In Czech)
Proton Recoil Detectors
Proton-recoil neutron spectrometry, 12:16622 (RA;CS;In Czech)

NEUTRON STARS
X Radiation
Compact galactic X-ray sources, 12:16950 (RA;CS)

NEUTRON TRANSPORT
Boltzmann Equation
Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 1, 12:15926 (RA;CS;In Czech)
Research Programs
The LBM program at the EPFL/LOTUS Facility, 12:17524 (J;US)

NEUTRON TRANSPORT THEORY
Algorithms
On the method of separation of regions in the framework of the neutron transport theory, 12:17310 (R;SU;In Russian)

NEUTRONS
See also RESONANCE NEUTRONS
THERMAL NEUTRONS
Dose Equivalents
Application of microdosimetry techniques in health physics, 12:17323 (RA;US)
Pair Production
Correlations between neutrons with small relative momenta produced in p-Pb interactions at 7,5 GeV/c, 12:17238 (R;SU)
Quality Factor
Application of microdosimetry techniques in health physics, 12:17323 (RA;US)

NEVADA
Geothermal Systems
Geologic and hydrologic research on the Moana geothermal system, Washoe County, Nevada, 12:15627 (J;US)

NEW ENGLAND
See FEDERAL REGION I

NEW MEXICO
Dolomite
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)

NEW YORK
Acid Rain
Chemical composition of precipitation at Long Island, NY, 12:16732 (J;NL)
Fossil-Fuel Power Plants
Water and steam chemistry control experiences with fossil peaking units, 12:15733 (RA;US)
Lakes
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Methanol Plants
Methanol production from indigenous resources in New York State, 12:15591 (R;US)
Methanol production from indigenous resources in New York State. Volume 1. Executive summary, 12:15592 (R;US)
Methanol production from indigenous resources in New York State. Volume 2. Technical and economic evaluation of conversion process plants, 12:15593 (R;US)
Methanol production from indigenous resources in New York State. Volume 3. Technical and economic evaluation of conversion process plants, 12:15594 (R;US)
Vehicles
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)

NEW ZEALAND
Biomass Plantations
Land suitability and availability for energy farming: a regional study Phase 2 report. Final report, 12:15609 (R;US)
Solar Water Heating
In-situ performance of solar water heaters: a testing programme. Final report, 12:15623 (R;US)

NEXT EUROPEAN TORUS
See NET TOKAMAK

NICKEL
Absorption Spectroscopy
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Crystal Defects
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)

Electrodeposition
Electroforming with nickel, iron, and aluminum, 12:16298 (R;US)
Electronic Structure
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Geochemistry
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Ion Implantation
Precipitation of Kr in Ni at room temperature, 12:16262 (R;US)
Mechanical Properties
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Microstructure
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
Photoemission
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Physical Radiation Effects
Temperature-dose dependences of porosity parameters in nickel irradiated by 1 meV nitrogen ions, 12:16274 (R;SU;In Russian)
Trapping of deuterium in argon-implanted nickel, 12:16302 (J;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Trace Amounts
Physical properties of oxide containing metal precipitates. Part II, 12:16344 (J;GB)
X-Ray Spectra
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)

NICKEL 58 REACTIONS
Heavy Ion Fusion Reactions
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)
Incomplete Fusion Reactions
Formation and decay of hot nuclei, 12:17241 (R;FR)

NICKEL 58 TARGET
Neutron Reactions
Analog giant dipole excitation in /sup 58/Ni(n,p)/sup 58/Co reaction at 17.3 MeV neutron energy, 12:17221 (RA;CS)
Nickel 58 Reactions
Ground-state proton radioactivity in the region of neutron-deficient nuclei above the tin, 12:17229 (R;DE;In German)

NICKEL 61 TARGET
Alpha Reactions
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)

NICKEL 62 TARGET
Helium 3 Reactions
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)

NICKEL ALLOYS
See also HASTELLOYS
INVAR
NICKEL BASE ALLOYS
Atom Transport
Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
Energy Spectra
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Physical Radiation Effects
Ion-induced spinodal-like decomposition of Fe-Ni-Cr Invar alloys, 12:16277 (R;US)
Reflectivity
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Valence
Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)

NICKEL BASE ALLOYS
See also INCONEL ALLOYS
Annealing
Annealing of cold worked hypostoichiometric Ni_3Al alloys using positron lifetime spectroscopy, 12:16240 (R;US)
Crystal Growth
Primary arm spacing in chill block melt spun Ni-Mo alloys, 12:16288 (R;US)
Ductility
Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
Fracture Properties
Ductility and fracture behavior of polycrystalline Ni_3Al alloys, 12:16264 (R;US)
Passivation
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)
Physical Radiation Effects
Formation of submicron metastable phase structures in alloys with focused electron or proton beams (Ni-Al), 12:16261 (R;US)
Surface Treatments
Formation of submicron metastable phase structures in alloys with focused electron or proton beams (Ni-Al), 12:16261 (R;US)
Tensile Properties
Mechanical properties of various alloys in hydrogen. Final report, 12:16289 (R;US)

NICKEL COMPLEXES
Catalytic Effects
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Preparation
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Properties
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

NICKEL IONS
Ion-Atom Collisions
Charge transfer in 1.4 MeV/u Ni/sup q+/ -> Kr collisions, q=16-22, 12:17071 (R;DE)

NICKEL OXIDES
Catalytic Effects
Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K, 12:15297 (J;US)

NICKEL-IRON BATTERIES
See IRON-NICKEL BATTERIES

NINE MILE POINT-1 REACTOR
Scriba, New York, USA
Decontamination
Implication of remote technology for decontamination activities, 12:16011 (RA;US)

NIOBATES
Specific compounds should be indexed by coordination of a descriptor in the form (CATION) COMPOUNDS and the above anion descriptor.
Phase Transformations
The role of point defects on structural phase transitions: Progress report for the year 1986-1987 (Li-doped $KMnF_3$, $KZnF_3$; $K(Ta,Nb)O_3$), 12:16355 (R;US)

NIOBIUM
Crystal Defects
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)

Crystal Structure
A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
Physical Radiation Effects
A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)
Superlattices
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Surface Coating
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Vacancies
A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)

NIOBIUM 93 TARGET
Neutron Reactions
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)

NIOBIUM ALLOYS
See also INCONEL 600
INCONEL 718
Corrosion
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Crystal Defects
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Fuel Cans
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Physical Radiation Effects
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)

NIOBIUM OXIDES
Crystallography
The elastic properties of LaNbO/sub 4/, 12:16340 (BA;US)
Elasticity
The elastic properties of LaNbO/sub 4/, 12:16340 (BA;US)
Quantitative Chemical Analysis
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)

NITRIC ACID
Monitoring
Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)

NITRIC OXIDE
NO.
Control
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln, 12:15314 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)

NITRILES
Chemical Reactions
Facile reductive cleavage of the C=O bond of acyl halides and the C identical with N bond of nitriles by hydrogen in the presence of sulfido-bridged molybdenum complexes, 12:16415 (J;US)

NITRO COMPOUNDS
Mutagenesis
Effects of highly aromatic complex chemical mixtures on the mutagenicity of amino-PAH, nitro-PAH and the intercalating agent, ICR191, 12:15343 (RA;US)

NITROGEN
Adsorption
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
Chemical Reaction Kinetics
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Quantitative Chemical Analysis
Semi-microdetermination of nitrogen in actinide compounds by Dumas method, 12:16376 (R;IN)
Quantity Ratio
Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast, 12:16786 (J;GB)

NITROGEN COMPOUNDS
See also NITROGEN OXIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Chemical Preparation
Formation of long carbon chain molecules during laser vaporization of graphite, 12:16424 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)

NITROGEN DIOXIDE
NO_2.
Monitoring
Combustion-torch ignition: Fluorescence imaging of NO/sub 2/, 12:15369 (BA;US)

NITROGEN NITRIDES
See NITROGEN

NITROGEN OXIDES
See also NITRIC OXIDE
NITROGEN DIOXIDE
NITROUS OXIDE
Air Pollution Control
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Chemical Reaction Yield
Experimental investigation of the formation of nitrogen oxides in combustion of coal dust. 2nd intermediate report covering the period from May 1, 1983 to June 30, 1984, 12:15329 (R;DE;In German)
Emission
Estimated monthly emissions of sulfur dioxide and oxides of nitrogen for the 48 contiguous states, 1975-1984: Volume 2, Supporting data bases and monthly SO_2 and NO/sub x/ estimates by state, 12:16770 (R;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Monitoring
Development of data processing, interpretation and analysis system for remote sensing of trace atmospheric gas species. Final report, period ending June 1986, 12:16706 (R;US)

NITROSAMINES
Carcinogen Screening
Tumor-promoting activity of complex organic mixtures, 12:15342 (RA;US)
Metabolism
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)
Toxicity
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)

NITROUS OXIDE
N_2O.
Ecological Concentration
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)
Environmental Effects
Model study of the greenhouse effects due to increasing atmospheric CH_4, N_2O, CF_2Cl_2, and $CFCl_3$, 12:16760 (J;US)

NMR SPECTROMETERS
Coaxial Cables
Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)
Superconducting Cables
Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)
NOBLE GASES
See RARE GASES
NOISE (REACTOR)
See REACTOR NOISE
NONAXIAL NUCLEI
See DEFORMED NUCLEI
NON-DISPERSIVE ION WAVES
See ION ACOUSTIC WAVES
NONRADIOACTIVE WASTES
See LIQUID WASTES
SOLID WASTES
NORTH ATLANTIC REGION
See FEDERAL REGION I
NORTHERN HEMISPHERE
Ambient Temperature
Surface air temperature anomalies for the Northern Hemisphere, 1881 - present, 12:16690 (R;GB)
Climates
Climatic data for Northern Hemisphere land areas 1851-1980, 12:16693 (R;US)
NORTHERN IRELAND
See UNITED KINGDOM
NPR REACTOR
See N-REACTOR
N-REACTOR
Reactor Kinetics
Development and applications of core simulation for the Hanford N Reactor, 12:15841 (J;US)
Flux flattening in a graphite-moderated core, 12:15842 (J;US)
NRTS
See IDAHO NATIONAL ENGINEERING LABORATORY
NSLS
Construction
Construction and commissioning of the national synchrotron light source, 12:16504 (RA;US)
Start-Up
Construction and commissioning of the national synchrotron light source, 12:16504 (RA;US)
Uses
Applications of synchrotron x-ray fluorescence to extraterrestrial materials, 12:16535 (R;US)
NUCLEAR ACCIDENTS
See ACCIDENTS
NUCLEAR ATTACKS
See NUCLEAR WEAPONS
NUCLEAR CONTROVERSY
See HUMAN POPULATIONS
NUCLEAR EMULSIONS
Sandwich nuclear emulsion emitter-detector-emitter systems with regulated sensitivity, 12:16607 (R;SU;In Russian)
NUCLEAR ENERGY
Research Programs
Sensitive nuclear activities in certain free world countries, 12:16162 (R;US)
NUCLEAR ENERGY AGENCY
See NEA
NUCLEAR ENGINEERING
Computer-Aided Design
Development of a microcomputer data base of manufacturing, installation, and operating experience for the NSSS designer, 12:15918 (J;US)
Data Base Management
Development of a microcomputer data base of manufacturing, installation, and operating experience for the NSSS designer, 12:15918 (J;US)
Organization and management of heterogeneous, dispersed data bases in nuclear engineering, 12:15917 (J;US)
Education
Graduate student use of DSNP at Idaho State University, 12:15933 (J;US)
Green's function for the evaluation for neutron cross sections, 12:15939 (J;US)
Informing the educators: one of the keys to public acceptance, 12:16164 (J;US)
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Nuclear engineering and health physics fellowship, 1985-1986, 12:15924 (R;US)
Nuclear thermal-hydraulics education: the Yankee Atomic/University of Lowell experience, 12:15936 (J;US)
Special simulation programs generated by DSNP for educational uses, 12:15934 (J;US)
Thermal hydraulics in undergraduate nuclear engineering education, 12:15937 (J;US)
Thermal hydraulics in nuclear engineering at UIUC, 12:15938 (J;US)
Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
University papers in American Nuclear Society (ANS) transactions with enrollment and degrees-III, 12:15941 (J;US)
USNY college degrees: three successful collaborations to fulfill NRC requirements, 12:15940 (J;US)
Heat Transfer
Nuclear thermal-hydraulics education: the Yankee Atomic/University of Lowell experience, 12:15936 (J;US)
Thermal hydraulics in undergraduate nuclear engineering education, 12:15937 (J;US)
Thermal hydraulics in nuclear engineering at UIUC, 12:15938 (J;US)
Hydraulics
Nuclear thermal-hydraulics education: the Yankee Atomic/University of Lowell experience, 12:15936 (J;US)
Thermal hydraulics in undergraduate nuclear engineering education, 12:15937 (J;US)
Thermal hydraulics in nuclear engineering at UIUC, 12:15938 (J;US)
NUCLEAR EXPLOSIONS
Specifically named single nuclear explosions are listed by name and the word EVENT, e.g., BOXCAR EVENT. All projects involving nuclear explosions are listed by the project name and the word PROJECT, e.g., PLOWSHARE PROJECT.
Legal Aspects
Nuclear weapons testing fallout: proving causation for exposure injury, 12:16163 (J;US)
Underground Explosions
Inversion for source parameters of underground nuclear explosions with implications for yield estimation. Technical report, 5 September 1985-5 March 1986, 12:16681 (R;US)
Uses
Nuclear explosives for peaceful purposes, 12:16683 (R;US)
NUCLEAR FACILITIES
See also FEED MATERIALS PLANTS
FUEL FABRICATION PLANTS
FUEL REPROCESSING PLANTS
ISOTOPE SEPARATION PLANTS
NUCLEAR POWER PLANTS
RADIOACTIVE WASTE FACILITIES
Contamination Regulations
Manual for implementing residual radioactivity guidelines, 12:15494 (RA;US)
Decommissioning
Decontamination and decommissioning of contaminated surplus facilities in the 200 areas of the Hanford site, 12:15545 (RA;US)
Financial assurance for decontamination and decommissioning: a Texas perspective, 12:15511 (RA;US)
Health physics or industrial hygiene, 12:15535 (RA;US)
Overview of the surplus facilities management program, 12:15542 (RA;US)
Simplified pathway analysis approach for establishing limits for soil contamination, 12:15508 (RA;US)
Use of site groundwater investigations in the decontamination and decommissioning of nuclear facilities, 12:15512 (RA;US)
Decontamination
Decontamination and decommissioning of contaminated surplus facilities in the 200 areas of the Hanford site, 12:15545 (RA;US)

Environmental impacts of the release of a transuranic actinide, americium-241, from a contaminated facility, 12:15516 (RA;US)
Financial assurance for decontamination and decommissioning: a Texas perspective, 12:15511 (RA;US)
Placement of the radiochemical processing plant at Oak Ridge National Laboratory into a safe standby condition, 12:15534 (RA;US)
Remote methods for decontamination and decommissioning operations, 12:15520 (RA;US)
Use of site groundwater investigations in the decontamination and decommissioning of nuclear facilities, 12:15512 (RA;US)
Dose Limits
Dose guidelines for decontamination and decommissioning projects, 12:15493 (RA;US)
Emergency Plans
Field evaluation of an emergency response atmospheric dispersion model, 12:16769 (J;US)
Maximum Acceptable Contamination
Allowable residual contamination levels for decommissioning: revisions to the method, 12:15492 (RA;US)
Radiation Monitoring
Database construction for assessment of chronic radionuclide releases, 12:15554 (RA;US)
Use of computerized, 3-dimensional solids modeling and data base management to support radiation mapping and ALARA planning, 12:15555 (RA;US)
Radiation Protection
Establishing a comprehensive cost-effective radiological protection program for decommissioning project, 12:16009 (RA;US)
Health physics or industrial hygiene, 12:15535 (RA;US)
Influence of gamma-ray skyshine on nuclear facilities design, 12:16117 (J;US)
Training program requirements for remote equipment operators in nuclear facilities, 12:16454 (J;US)
Radioactive Waste Management
Radioactive waste management in radioactive installations, 12:15412 (R;BR;In Portuguese)
Remedial Action
Analysis of uranium and thorium contaminated soils during a cleanup and interment operation, 12:15550 (RA;US)
Site Surveys
Radiological field survey problems & solutions, 12:15526 (RA;US)
Soils
Review of current research into soil decontamination and volume reduction techniques for purposes of transportation and disposal, 12:15517 (RA;US)
NUCLEAR FRAGMENTS
See also HYPERNUCLEI
Fermi Level
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
Reviews
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)
NUCLEAR FUEL ELEMENTS
See FUEL ELEMENTS
NUCLEAR FUELS
See also SPENT FUELS
Amortization
Fuel cost impacts of using constant cycle-based amortization rates, 12:15906 (J;US)
Cost
Possible short and long term evolution in the cost of PWRs nuclear fuel and coal, 12:15405 (RA;XA)
Fabrication
Interfacing robotics with plutonium fuel fabrication, 12:15377 (R;US)
NUCLEAR MATERIALS MANAGEMENT
Accounting
FERC perspectives on nuclear fuel accounting issues, 12:15566 (J;US)
Fundamental data analyses for measurement control, 12:15564 (R;US)
Nuclear fuels accounting interface: River Bend experience, 12:15778 (J;US)
Nuclear fuel lease accounting, 12:15567 (J;US)
Alarm Systems
Fundamental data analyses for measurement control, 12:15564 (R;US)
Control Systems
Fundamental data analyses for measurement control, 12:15564 (R;US)
Decision Making
Fundamental research of decision support systems: Final report, 12:15563 (R;US)
Leasing
Nuclear fuel lease accounting, 12:15567 (J;US)
NUCLEAR MATTER
Astrophysics
Aborigines of the nuclear desert, 12:16952 (RA;CS)
Hartree-Fock Method
Static and dynamic aspects of nuclear matter distribution: microscopic calculations and experimental data, 12:17253 (R;FR;In French)
Hartree-Fock-Bogolyubov Theory
Static and dynamic aspects of nuclear matter distribution: microscopic calculations and experimental data, 12:17253 (R;FR;In French)
NUCLEAR MEDICINE
See also RADIOLOGY
Radiopharmaceuticals
Joint CDRH (Center for Devices and Radiological Health) and state quality-assurance surveys in nuclear medicine: Phase 2 - radiopharmaceuticals, 12:16861 (R;US)
NUCLEAR MODELS
See also EXCITON MODEL
PARTICLE-HOLE MODEL
QUASIPARTICLE-PHONON MODEL
Supersymmetry
Supersymmetry in nuclear physics, 12:17302 (BA;US)
NUCLEAR PHYSICS
Use only for indexing articles of very broad coverage, such as annual reviews, text books, etc.
BARC
Annual report of the Nuclear Physics Division [for] period ending December 31, 1982, 12:17190 (R;IN)
Data Analysis
Uncertainties in scientific measurements, 12:17216 (R;US)
Research Programs
Annual report of the Nuclear Physics Division [for] period ending December 31, 1982, 12:17190 (R;IN)
Research in theoretical nuclear physics: Annual report, 1985/1986, 12:17258 (R;US)
Reviews
HMI Section of Nuclear and Radiation Physics - Annual report 1985, 12:17194 (R;DE;In German and English)
NUCLEAR POWER
Cost
Cost and financing of nuclear power program in Turkey, 12:15903 (RA;XA)
Costs and financing of nuclear power programmes in developing countries. Proceedings of a seminar held in Vienna, 9-12 September 1985, 12:15881 (R;XA)
Nuclear power costs in developing countries, 12:15885 (RA;XA)
Presentation of the results of the seminar on cost and financing of nuclear power programmes in developing countries, 12:15878 (RA;XA)
Status of and perspectives and constraints for nuclear power in developing countries, 12:15882 (RA;XA)
Economics
Country risk evaluation by the supplier, 12:15896 (RA;XA)
Economic case for small and medium power reactors in India, 12:15872 (RA;XA)
Retrospective economic and financial analysis of the Laguna Verde Project, 12:15892 (RA;XA)
Efficiency
Economic efficiency of nuclear power in the People's Republic of China, 12:15887 (RA;XA)

Financing
Cost and financing of nuclear power program in Turkey, 12:15903 (RA;XA)
Costs and financing of nuclear power programmes in developing countries. Proceedings of a seminar held in Vienna, 9-12 September 1985, 12:15881 (R;XA)
Country risk evaluation by the supplier, 12:15896 (RA;XA)
Financial problems of nuclear programmes. The experience of Argentina, 12:15891 (RA;XA)
Nuclear project finance in developing countries: The multi-country financing alternative, 12:15894 (RA;XA)
Presentation of the purpose of the meeting, 12:15876 (RA;XA)
Presentation of the results of the seminar on cost and financing of nuclear power programmes in developing countries, 12:15878 (RA;XA)
Retrospective economic and financial analysis of the Laguna Verde Project, 12:15892 (RA;XA)
Status of and perspectives and constraints for nuclear power in developing countries, 12:15882 (RA;XA)
Hazards
Risk assessment from point of view of supplier, 12:15893 (RA;XA)
Sharing of benefits and risks in regard to the establishment of nuclear power programmes in developing countries, 12:15890 (RA;XA)
Public Opinion
Informing the educators: one of the keys to public acceptance, 12:16164 (J;US)
Radiation Protection
Nuclear power safety economics, 12:15870 (R;SU;In Russian)
Risk Assessment
Risk assessment from point of view of supplier, 12:15893 (RA;XA)
NUCLEAR POWER PLANTS
DER 85: main facts, 12:15798 (R;FR;In French)
Capitalized Cost
Nuclear rate regulation, 12:15914 (J;US)
Prudence reviews, with hindsight, 12:15912 (J;US)
Utility prudency issues, 12:15916 (J;US)
Computerized Simulation
Graduate student use of DSNP at Idaho State University, 12:15933 (J;US)
Input and control management scheme for the DSNP simulation language, 12:15935 (J;US)
PPC - an interactive preprocessor/compiler for the DSNP simulation language, 12:15932 (J;US)
Special simulation programs generated by DSNP for educational uses, 12:15934 (J;US)
Construction
Prudence reviews, with hindsight, 12:15912 (J;US)
Schedule reconciliation tests for management prudency determination, 12:15915 (J;US)
Utility prudency issues, 12:15916 (J;US)
Control Rooms
Application of embedded training in nuclear power plant control rooms, 12:16071 (J;US)
Cost
Factors influencing capital costs of nuclear power plant in Finnish conditions, 12:15888 (RA;XA)
DC Systems
Four-train support always more reliable than a two-train support?, 12:16097 (J;US)
Decommissioning
Intact decommissioning option for nuclear power plants, 12:15543 (RA;US)
Economics
Cost of corrosion and scale in US utilities, 12:15709 (RA;US)
Economic aspects of implementing a SMPR project. A case study for Bangladesh, 12:15889 (RA;XA)
Nuclear power and economics: keys to continuing progress, 12:15920 (J;US)
Efficiency
Nuclear power plant performance incentives established by state PUCs, 12:15913 (J;US)
Electric Generators
Emergency diesel generator reliability at US nuclear power plants, 12:16124 (J;US)
Electrical Equipment
Earthquake resistance problems of electric equipment, 12:16042 (RA;CS;In Czech)
Emergency Plans
1986 viewpoint of emergency preparedness in the upper midwest, 12:16072 (J;US)
Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario, 12:16073 (J;US)
Fault Tree Analysis
Quantile arithmetic methodology for uncertainty propagation in fault trees, 12:16111 (J;US)
Feedwater
Four-train support always more reliable than a two-train support?, 12:16097 (J;US)
Financing
Can nuclear power survive rate-of-return regulation?, 12:16178 (J;US)
Commercial bank contribution in the financing of nuclear plant export contracts, 12:15902 (RA;XA)
Electric utility regulation - today and tomorrow, 12:16177 (J;US)
Nuclear power plants and project finance, 12:15897 (RA;XA)
OECD Consensus and loan conditions on officially supported financing for nuclear power plants, 12:15900 (RA;XA)
Planning for rate base treatment of large power plants, 12:16179 (J;US)
Present situation of export credits, 12:15901 (RA;XA)
Project financing. Financial planning model (FINPLAN), 12:15899 (RA;XA)
Winning the rate base battle, 12:16176 (J;US)
Fuel Cycle
Nuclear fuel cycle variables calculation code - FUTURE, 12:15908 (J;US)
Fuel Management
Choosing the optimum burnup, 12:15909 (J;US)
Effects of high burnup on spent-fuel casks, 12:15910 (J;US)
Examination of fuel reinsertion strategies for out-of core fuel management, 12:15907 (J;US)
Investment
Project financing. Financial planning model (FINPLAN), 12:15899 (RA;XA)
Leaks
Acoustic leak detection in nuclear power plants, 12:15945 (RA;US)
Loss of Coolant
LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique, 12:16096 (J;US)
Low-Level Radioactive Wastes
Economic considerations for nuclear power plant LLW, 12:15464 (J;US)
Evaluation of the potential for deregulated disposal of very low level wastes from nuclear power plants, 12:15455 (J;US)
Management
Striving for excellence, 12:15921 (J;US)
Mechanical Vibrations
Evaluation of alternative techniques for machinery vibration monitoring, 12:15684 (RA;US)
Modifications
Method to integrate PRA results with plant upgrades, 12:16110 (J;US)
Nuclear Trade
Sales of nuclear power stations to developing countries: Risk assessment for export credit insurance, 12:15895 (RA;XA)
Outages
Determination of station blackout frequency-duration relationships, 12:16125 (J;US)
Emergency diesel generator reliability at US nuclear power plants, 12:16124 (J;US)
Performance
Nuclear power plant performance incentives established by state PUCs, 12:15913 (J;US)
Nuclear power and economics: keys to continuing progress, 12:15920 (J;US)

Personnel
New approaches to performance-based project management training, 12:15922 (J;US)
Pressure Vessels
Analyses of solid-state track recorder pressure vessel neutron dosimetry, 12:15951 (J;US)
Pumps
Detection of incipient failure in vertical pumps, 12:15687 (RA;US)
Monitoring and diagnostic system for reactor coolant pump seals, 12:15947 (RA;US)
Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)
Reactor coolant pump seal leakage monitoring, 12:15946 (RA;US)
Quality Assurance
Reinspection methods implemented for quality, 12:16109 (J;US)
Radiation Protection
Influence of gamma-ray skyshine on nuclear facilities design, 12:16117 (J;US)
PROCESS - a source term calculation program for the PC, 12:16113 (J;US)
Reactor Accidents
LOCA uncertainty analysis using the Fourier Amplitude Sensitivity Test and the Stepwise Regression Technique, 12:16096 (J;US)
Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario, 12:16073 (J;US)
Reflection of gamma radiation in a spherical concrete-walled room, 12:16115 (J;US)
Reactor Components
Looking out for common cause failures, 12:15919 (J;US)
Reinspection methods implemented for quality, 12:16109 (J;US)
Welding nuclear plant components, 12:15950 (J;US)
Reactor Control Systems
Implicit Kalman filter algorithm for nuclear reactor analysis, 12:15963 (J;US)
Reactor Decommissioning
Nuclear decommissioning - the financial R & R problems, 12:15905 (J;US)
Reactor Kinetics
Implicit Kalman filter algorithm for nuclear reactor analysis, 12:15963 (J;US)
Parity simulation for nuclear plant analysis, 12:15928 (J;US)
Reactor Maintenance
Looking out for common cause failures, 12:15919 (J;US)
Monitor III, 12:15923 (J;US)
Tomorrow's mobile robots in today's nuclear power plants, 12:16131 (J;US)
Reactor Operation
Striving for excellence, 12:15921 (J;US)
Reactor Operators
Application of embedded training in nuclear power plant control rooms, 12:16071 (J;US)
Reactor Safety
Determination of station blackout frequency-duration relationships, 12:16125 (J;US)
Emergency diesel generator reliability at US nuclear power plants, 12:16124 (J;US)
Evaluating the safety of nuclear plant changes, 12:16112 (J;US)
Four-train support always more reliable than a two-train support?, 12:16097 (J;US)
Reinspection methods implemented for quality, 12:16109 (J;US)
Regulations
Nuclear rate regulation, 12:15914 (J;US)
Risk Assessment
Benchmark of systematic human action reliability procedure, 12:16068 (J;US)
Continuous Bayesian updating; Normal and two stage, 12:16095 (J;US)
Effect of extreme forces on structures and equipment of nuclear power plants, 12:16044 (RA;CS;In Czech)
Human factors in risk assessments of nuclear power plants, 12:16070 (J;US)
Method to integrate PRA results with plant upgrades, 12:16110 (J;US)
Quantile arithmetic methodology for uncertainty propagation in fault trees, 12:16111 (J;US)
Sales of nuclear power stations to developing countries: Risk assessment for export credit insurance, 12:15895 (RA;XA)
Robots
Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario, 12:16073 (J;US)
Tomorrow's mobile robots in today's nuclear power plants, 12:16131 (J;US)
Seismic Effects
Present state of earthquake resistance calculations for the main generating units of nuclear power plants Mochovce and Temelin, 12:16040 (RA;CS;In Czech)
Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)
Spent Fuel Storage
Effects of high burnup on spent-fuel casks, 12:15910 (J;US)
Steam Generators
Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Steam Systems
Evaluating the safety of nuclear plant changes, 12:16112 (J;US)
Steam Turbines
Cost of corrosion and scale in US utilities, 12:15709 (RA;US)
Turbogenerators
Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)

NUCLEAR POWER STATIONS
See NUCLEAR POWER PLANTS

NUCLEAR REACTION ANALYSIS
Uses
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

NUCLEAR REACTION KINETICS
Fermi Level
Fragmentation of the projectile near the Fermi energy, 12:17208 (R;FR)

NUCLEAR REACTIONS
See also BREAKUP REACTIONS
HEAVY ION FUSION REACTIONS
PHOTONUCLEAR REACTIONS
PRECOMPOUND-NUCLEUS EMISSION
THERMONUCLEAR REACTIONS
Correlation Functions
Statistical methods of the description of quark degrees of freedom, 12:17294 (R;SU;In Russian)

NUCLEAR SAFETY
See RADIATION PROTECTION

NUCLEAR STRUCTURE
Data Processing
Co-ordination of the international network of nuclear structure and decay data evaluators. Summary report of a consultants' meeting held at the Centre d'Etudes Nucleaires de Grenoble, France, 2-5 June 1986, 12:17196 (R;XA)
Dirac Equation
Probing for Dirac vacuum structure in nuclei, 12:17300 (J;NL)
Gamma Radiation
Gamma-ray competition in continuum, 12:17265 (RA;CS)
Research Programs
The structure of nuclei far from beta stability: Progress report for the period May 15, 1986 to May 14, 1987, 12:17193 (R;US)
Supersymmetry
Supersymmetry in nuclear physics, 12:17302 (BA;US)

NUCLEAR WASTES
See RADIOACTIVE WASTES

NUCLEAR WEAPON TESTS
See NUCLEAR EXPLOSIONS
NUCLEAR WEAPONS
Computer-Aided Design
Computation: The nexus of nuclear weapon development, 12:17677 (BA;US)
Testing
Nuclear weapon R and D and the role of nuclear testing, 12:16684 (R;US)
On the degree of verification needed to support a comprehensive test ban, 12:16685 (R;US)
Yields
On the degree of verification needed to support a comprehensive test ban, 12:16685 (R;US)
NUCLEASES
Biochemistry
Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers, 12:16882 (J;US)
NUCLEI
See also COSMIC NUCLEI
DEFORMED NUCLEI
EVEN-EVEN NUCLEI
HEAVY NUCLEI
HYPERNUCLEI
LIGHT NUCLEI
ODD-ODD NUCLEI
Structure Functions
Do multinucleon clusters exist in a nucleus, 12:17262 (R;SU)
NUCLEON-NUCLEON INTERACTIONS
Potential Scattering
Nucleon-nucleon scattering in a nonrelativistic quark model, 12:17133 (R;DE;In German)
NUCLEONS
See also NEUTRONS
PROTONS
Decay
Nucleon decay experiments: status and prospects, 12:17094 (R;US)
Structure Functions
Do multinucleon clusters exist in a nucleus, 12:17262 (R;SU)
NUMERICAL ANALYSIS
Research Programs
Computer science research: Computation directorate, 12:17657 (R;US)
NUTRIENTS
Losses
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Uptake
Effects of atmospheric CO_2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil, 12:16908 (J;US)

O

O CODES
Sensitivity Analysis
Sensitivity analysis of ORION, 12:15362 (R;US)
OAK RIDGE GASEOUS DIFFUSION PLANT
See ORGDP
OAK RIDGE NATIONAL LABORATORY
See ORNL
OAK RIDGE RESERVATION
Wild Animals
Resource management plan for the Oak Ridge Reservation: Volume 24, Threatened and endangered animal species, 12:16782 (R;US)
OAKS
Photosynthesis
Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)
Plant Growth
Effects of atmospheric CO_2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil, 12:16908 (J;US)
OCCUPATIONAL SAFETY
Health-hazard evaluation report HHE-80-022-OC, Tetley, Inc., Williamsport, Pennsylvania, 12:16726 (R;US)
Industrial-hygiene survey report, Precision Castparts Corp., Portland, Oregon (2-ethoxyethanol), 12:16713 (R;US)
Regulatory Guides
Safety work organization in nuclear power plant. A9. Volume 1, 12:17637 (R;CS;In Czech)
Safety work organization in nuclear power plant. A9. Volume 2. Annexes, 12:17638 (R;CS;In Czech)
OCEANIA
Decontamination
Johnston Atoll cleanup - accurate monitoring for actinides, 12:15528 (RA;US)
Radiation Monitoring
Johnston Atoll cleanup - accurate monitoring for actinides, 12:15528 (RA;US)
OCONEE-1 REACTOR
Oconee, South Carolina, USA
Secondary Coolant Circuits
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
Steam Generators
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
OCONEE-2 REACTOR
Oconee, South Carolina, USA
Secondary Coolant Circuits
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
Steam Generators
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
ODD-ODD NUCLEI
Odd protons, odd neutrons.
See also CESIUM 134
COBALT 60
DEUTERIUM
FLUORINE 24
LITHIUM 6
LITHIUM 8
PHOSPHORUS 38
SILVER 110
Pairing Energy
Method to determine the pairing energy for excited nuclei, 12:17267 (RA;CS)
OECD
See also NEA
Nuclear Power Plants
OECD Consensus and loan conditions on officially supported financing for nuclear power plants, 12:15900 (RA;XA)
OFFICE BUILDINGS
Asbestos
Assessment of assay methods for evaluating asbestos abatement technology at the Corvallis Environmental Research Laboratory, 12:16716 (R;US)
Lighting Systems
Occupant evaluation of commercial office lighting: Volume 1, Methodology and bibliography, 12:16205 (R;US)
OFFSHORE PLATFORMS
Includes gravity or fixed, floating, and towed platforms.
Design
Structural optimization of large ocean-going structures, 12:16501 (RA;US)
OIL RESIDUES
See PETROLEUM RESIDUES
OIL SAND DEPOSITS
Geology
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
In-Situ Combustion
Experimental and theoretical studies of reverse combustion in porous media, 12:15331 (BA;US)
Petrology
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)

OIL SAND MINING
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
OIL SAND OILS
See BITUMENS
OIL SANDS
In-Situ Processing
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
Mechanical Properties
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
Meetings
Proceedings of the 1986 tar sands symposium, 12:15371 (R;US)
OIL SHALE WASTE WATER
See OIL SHALES
WASTE WATER
OIL SHALES
Chemical Composition
Assay products from Green River oil shale, 12:15373 (R;US)
Density
Assay products from Green River oil shale, 12:15373 (R;US)
Diagenesis
Origins of the Messel oil shale and structure of petroporphyrins, 12:15372 (R;DE;In German)
Oil Yields
Assay products from Green River oil shale, 12:15373 (R;US)
Pyrolysis
Assay products from Green River oil shale, 12:15373 (R;US)
Qualitative Chemical Analysis
Origins of the Messel oil shale and structure of petroporphyrins, 12:15372 (R;DE;In German)
Quantitative Chemical Analysis
Origins of the Messel oil shale and structure of petroporphyrins, 12:15372 (R;DE;In German)
Retorting
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Solvent Extraction
Identification of organic compounds in the bitumen of Chattanooga oil shale, 12:15374 (J;US)
OIL WELLS
Carbon Dioxide Injection
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Economic evaluation of a CO/sub 2/-enhanced oil recovery flood at the Rock Creek Field, Roane County, West Virginia, 12:15360 (BA;US)
Gas Injection
Accurate vaporizing gas-drive minimum miscibility pressure prediction, 12:15359 (BA;US)
Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)
Microemulsion Flooding
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Experimental study of waterflooding from a 2-D layered sand model, 12:15354 (RA;US)
Waterflooding
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
OLEFINS
See ALKENES
OMAHA VETERANS TRIGA-MK-1
See TRIGA-VETERANS REACTOR
OMEGA PARTICLES
Hadronic Particle Decay
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
Quark Model
Pseudoscalar and vector meson masses in the quark loop model, 12:17151 (R;SU;In Russian)
ONCOGENIC TRANSFORMATIONS
Gene Regulation
Hypervirulence of Agrobacterium tumefaciens A281 is encoded in a region of pTiBo542 outside of T-DNA, 12:16803 (J;US)
T-DNA and opine synthetic loci in tumors incited by Agrobacterium tumefaciens A281 on soybean and alfalfa plants, 12:16804 (J;US)
ONIONS
Radurization
Detection of radiation processing in onions, 12:16848 (RA;CS;In Czech)
ON-LINE COMPUTERS
See COMPUTERS
ON-LINE CONTROL SYSTEMS
Data Processing
Representation on flow information systems with Petri nets use, 12:17652 (R;SU;In Russian)
Materials Testing
Control and data acquisition system of the RIPS facility for the plastic property irradiation studies, 12:16483 (R;SU;In Russian)
ON-LINE MEASUREMENT SYSTEMS
Image Processing
Dialogue scanning measuring systems, 12:16637 (R;SU;In Russian)
OPEC
Organization of Petroleum Exporting Countries
Economic Policy
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Mathematical Models
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
OPEN-CYCLE MHD GENERATORS
Electrodes
Electrode boundary layer and its influence on the power output characteristics in open-cycle Faraday MHD generators, 12:16184 (R;IN)
OPERATION (REACTOR)
See REACTOR OPERATION
OPTICAL FILTERS
Design
Optical fiber inspection system, 12:16676 (P;US)
Operation
Optical fiber inspection system, 12:16676 (P;US)
OPTICAL SPECTROMETERS
Performance
Development of a coherent optical particle spectrometer for industrial applications: a feasibility investigation, 12:16725 (R;US)
OPTICAL SYSTEMS
Data Acquisition Systems
Using vision systems when bar code won't work, 12:17648 (R;US)
OREGON
Wind Power
Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon, 12:15640 (BA;US)
ORGANIC ACIDS
Excluding NUCLEIC ACIDS and NUCLEOTIDES.
Solubility
Release of organic chelating agents from solidified decontamination wastes, 12:15408 (R;US)
ORGANIC ARSENIC COMPOUNDS
Binding Energy
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)
Electronic Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and

electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

Vibrational States
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

ORGANIC COMPOUNDS
See also ALDEHYDES
AMINES
AROMATICS
CARBOHYDRATES
HYDROCARBONS
KETONES
ORGANIC ACIDS
ORGANIC ARSENIC COMPOUNDS
ORGANIC PHOSPHORUS COMPOUNDS
ORGANIC POLYMERS
ORGANIC SULFUR COMPOUNDS
ORGANOMETALLIC COMPOUNDS
PROTEINS

Biochemical Reaction Kinetics
In vivo interactions of chemical mixtures with DNA, 12:16897 (RA;US)

Carcinogen Screening
Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay, 12:16902 (RA;US)

Carcinogenesis
Analysis of DNA adducts using trace organic analytical techniques, 12:16896 (RA;US)
Responses of the respiratory tract to inhaled particle-organic mixtures, 12:16893 (RA;US)

Catalytic Effects
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

Chemical Preparation
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

Chemical Properties
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

Chemical Reactions
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)

Crystal Lattices
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ (X^- = IBr_2^-, AuI_2^-, I_3^-) (ET = bis(ethylenedithio)tetrathiafulvalene), 12:16412 (J;US)

Ecological Concentration
Changes in soil carbon storage and associated properties with disturbance and recovery, 12:16778 (BA;US)

Electron-Phonon Coupling
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ (X^- = IBr_2^-, AuI_2^-, I_3^-) (ET = bis(ethylenedithio)tetrathiafulvalene), 12:16412 (J;US)

Metabolism
In vivo interactions of chemical mixtures with DNA, 12:16897 (RA;US)
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)
Separations and synthesis support of pharmacokinetic studies, 12:16887 (RA;US)

Mixtures
Separations and synthesis support of pharmacokinetic studies, 12:16887 (RA;US)

Molecular Structure
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)

Mutagen Screening
Comparative in vitro and in vivo models of cytotoxicity and genotoxicity, 12:16901 (RA;US)

Teratogenesis
Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)

Toxicity
Developmental effects in rats and mice after dermal exposure to a high-boiling complex organic mixture, 12:15337 (RA;US)
Effects of complex organic mixtures of coal liquid on cardiovascular function, 12:15338 (RA;US)
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)

Transition Temperature
Importance of intermolecular hydrogen...hydrogen and hydrogen...anion contacts for the lattice softness, the electron-phonon coupling, and the superconducting transition temperatures, T/sub c/, of organic conducting salts β-$(ET)_2X$ (X^- = IBr_2^-, AuI_2^-, I_3^-) (ET = bis(ethylenedithio)tetrathiafulvalene), 12:16412 (J;US)

Volatile Matter
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)

Waste Disposal
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)

ORGANIC IODINE COMPOUNDS

Chemical Preparation
Nuclear medicine: Progress report for quarter ending September 30, 1986, 12:16813 (R;US)

Tissue Distribution
Nuclear medicine: Progress report for quarter ending September 30, 1986, 12:16813 (R;US)

ORGANIC PHOSPHORUS COMPOUNDS
Excluding NUCLEIC ACIDS and NUCLEOTIDES.

Binding Energy
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

Crystal Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

Electronic Structure
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

Vibrational States
Ligand perturbation of the molecular and electronic structures of quadruply bonded dimers. The Crystal structures of $Mo_2Br_4(PMe_3)_4$ and $Mo_2I_4(PMe_3)_4$, and the vibrational and electronic spectra of a series of $M_2X_4L_4$ complexes, 12:16410 (J;US)

ORGANIC POLYMERS
See also POLYAMIDES

POLYVINYLS
Absorption Spectra
Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986 (Poly (N-vinylcarbazole) (PVCA)), 12:16402 (R;US)
Photoluminescence
Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986 (Poly (N-vinylcarbazole) (PVCA)), 12:16402 (R;US)
ORGANIC SULFUR COMPOUNDS
Chemical Reactions
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Labelling
Synthesis of 1-(p-isothiocyanatobenzyl) derivatives of DTPA and EDTA. Antibody labeling and tumor-imaging studies, 12:16841 (J;US)
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
ORGANIC WASTES
Biochemical Oxygen Demand
Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
Biodegradation
Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
ORGANIZATION ECONOMIC CO-OPERATION AND DE
See OECD
ORGANOMETALLIC COMPOUNDS
For compounds of metals and semimetals with organic compounds, but only when the metal or semimetal is directly bound to carbon.
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Electrochemistry
Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987, 12:16423 (R;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
ORGDP
Scrap Metals
Cleanup operations at the Oak Ridge Gaseous Diffusion Plant contaminated metal scrapyard, 12:15415 (R;US)
ORNL
Research Programs
ORNL trends and balances, 1987-1992, 12:16160 (R;US)
Separations and synthesis support of pharmacokinetic studies, 12:16887 (RA;US)
OSCILLATIONS (PLASMA)
See PLASMA WAVES
OUTER CONTINENTAL SHELF
See CONTINENTAL SHELF
OXIDES
See also ALUMINIUM OXIDES
AMERICIUM OXIDES
CALCIUM OXIDES
CHROMIUM OXIDES
GADOLINIUM OXIDES
HAFNIUM OXIDES
LANTHANUM OXIDES
LEAD OXIDES
LITHIUM OXIDES
MAGNESIUM OXIDES
MOLYBDENUM OXIDES
NEPTUNIUM OXIDES
NICKEL OXIDES
NIOBIUM OXIDES
NITROGEN OXIDES
PLUTONIUM OXIDES
POTASSIUM OXIDES
SILICON OXIDES
THORIUM OXIDES
THULIUM OXIDES
TITANIUM OXIDES
TRITIUM OXIDES
URANIUM OXIDES
YTTRIUM OXIDES
ZIRCONIUM OXIDES
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
OXIRANS
See EPOXIDES
OXYCHLORIDES
Crystal Structure
Further aspects of the structure and magnetism of the layered compound Fe(III)$ClMoO_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
Magnetic Susceptibility
Further aspects of the structure and magnetism of the layered compound Fe(III)$ClMoO_4$: Moessbauer spectroscopy, susceptibility, and powder neutron diffraction studies, 12:16335 (J;US)
OXYGEN
Chemisorption
Oxygen chemisorption as a tool for characterizing "young" chars, 12:15298 (J;US)
Desorption
Impact desorption cross section studies of impurity release into magnetically confined plasmas. Final report for the period 1 July 1982-31 December 1985, 12:17433 (R;XA)
Ecological Concentration
Preliminary observations of oxygen and carbon dioxide of the wintertime Bering Sea marginal ice zone, 12:16787 (J;GB)
Response Modifying Factors
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)
OXYGEN 16 REACTIONS
Incomplete Fusion Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
OXYGEN 16 TARGET
Electron Reactions
Nuclear physics with internal targets in electron storage rings, 12:17203 (R;US)
Pion Plus Reactions
Dispersive effects in low energy pion-nucleus scattering, 12:17301 (J;NL)
OXYGEN 22
Beta Decay
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
OXYGEN COMPOUNDS
See also ALUMINATES
CARBONIC ACID
FERRITES
HYPOIODOUS ACID
NIOBATES

OXIDES
OXYCHLORIDES
PHOSPHATES
SULFATES
TANTALATES
WATER
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN
OXYGEN HYDRIDES
See WATER
OXYMETHYLENE
See FORMALDEHYDE
OYSTER CREEK-1 REACTOR
Forked River, New Jersey, USA
Emergency Plans
Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment, 12:16074 (J;US)
Reactor Accidents
Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment, 12:16074 (J;US)
Reactor Safety
Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)
Transients
Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)
OZONE
Monitoring
Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)

P

P CODES
Development of a PCMI analysis code for the Fugen MOX fuel rod, 12:15845 (BA;US)
P WAVES (SEISMIC)
See SEISMIC P WAVES
PACIFIC GAS DIABLO CANYON-1 REACTOR
See DIABLO CANYON-1 REACTOR
PACIFIC GAS DIABLO CANYON-2 REACTOR
See DIABLO CANYON-2 REACTOR
PACIFIC ISLANDS
See OCEANIA
PACIFIC NORTHWEST LABORATORIES
See BATTELLE PACIFIC NORTHWEST LABORATORIES
PAH
See POLYCYCLIC AROMATIC HYDROCARBONS
PAIR PRODUCTION
Coulomb Field
Coulomb pair-creation, 12:17384 (R;HU)
Vacuum Polarization
Coulomb pair-creation, 12:17384 (R;HU)
PAKISTAN (EAST)
See BANGLADESH
PAKS-2 REACTOR
Paks, Tolna, Hungary
Temperature Coefficient
Measurement of reactivity temperature coefficient by noise method in a power reactor, 12:15802 (R;HU)
PALEOCLIMATOLOGY
Global Aspects
Global paleoclimatic data for 6000 yr B.P., 12:16692 (R;US)
PALLADIUM
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)
PALLADIUM ALLOYS
Valence
Valence instabilities in amorphous rare earth compound films, 12:16303 (J;NL)
PALLADIUM COMPLEXES
Catalytic Effects
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Preparation
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Properties
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Reactions
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Crystal Structure
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
PALO DURO BASIN
Railways
Rail transportation corridor analysis report: Deaf Smith County location in the Palo Duro Basin, Texas, 12:15487 (R;US)
PALO VERDE-1 REACTOR
Wintersburg, Arizona
Steam Generators
Palo Verde full-range feedwater control system operating experience, 12:15819 (J;US)
PANAMA
Carbon Cycle
Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
PANCREAS
Radioisotope Scanning
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
PAPER CHROMATOGRAPHY
See CHROMATOGRAPHY
PAPER INDUSTRY
Electric Power
Roles of electricity: Pulp and papermaking, 12:16219 (R;US)
Power Demand
Electricity and the pulp and paper industry, 12:16218 (R;US)
Power Generation
Electricity and the pulp and paper industry, 12:16218 (R;US)
Waste Processing
Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
PARABOLIC DISH COLLECTORS
Stirling Engines
Solar Stirling receiver alternatives for the terrestrial solar application, 12:15619 (R;US)

PARABOLIC POINT COLLECTORS
See PARABOLIC DISH COLLECTORS
PARALLEL PROCESSING
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Distributing hot-spot addressing in large-scale multiprocessors, 12:17673 (BA;US)
Execution of parallel loops on parallel processor systems, 12:17666 (BA;US)
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)
Algorithms
Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions, 12:17668 (BA;US)
C Codes
CUBIX: Programming hypercubes without programming hosts, 12:17646 (R;US)
Computer Architecture
Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)
Research Programs
Computer science research: Computation directorate, 12:17657 (R;US)
The New York University Ultracomputer, 12:17676 (BA;US)
T Codes
Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)
PARTICLE BEAM FUSION ACCELERATOR
Diagnostic Techniques
Intense lithium ion beam diagnostic using the inverse nuclear reactor D(^{7}Li,n)^{8}Be, 12:17487 (R;US)
PARTICLE BOOSTERS
First stages of a multistage accelerator.
Beam Bunchers
HF-field stabilization in the booster injector debuncher, 12:16552 (R;SU;In Russian)
Beam Dynamics
Beam dynamics calculations for the linac booster beam line, 12:16522 (R;US)
PARTICLE IDENTIFICATION
Telescope Counters
Identification of electrons by means of a scintillation telescope at Esub(e) = 1-3 GeV, 12:16606 (R;SU;In Russian)
PARTICLE INTERACTIONS
See also HADRON-HADRON INTERACTIONS
QUARK-ANTIQUARK INTERACTIONS
QUARK-QUARK INTERACTIONS
Particle Rapidity
On short-range rapidity fluctuations in high energy collisions, 12:17127 (R;FR)
PARTICLE TRACKS
Biophysics
Double differential ionization cross sections, 12:17314 (RA;US)
Monte Carlo calculation of energy deposition and ionization yield for high energy protons, 12:17324 (RA;US)
Theoretical single differential cross sections for bare ions, 12:17315 (RA;US)
Theoretical cross sections for ionization structured ions, 12:17317 (RA;US)
Total ion and electron yields, 12:17318 (RA;US)
Image Processing
Realization of one algorithm for track elements isolation in analyzing the images of nuclear interactions, 12:16638 (R;SU;In Russian)
Microdosimetry
Measurement of energy deposition near heavy ion tracks, 12:17320 (RA;US)
PARTICLE-HOLE MODEL
Energy-Level Density
Particle-hole state densities for statistical multi-step compound reactions, 12:17268 (RA;CS)
PARTICULATES
Prior to September 1981, this concept was indexed to PARTICLES and AEROSOLS.
Adhesion
The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)
Air Pollution Control
Identification, assessment, and control of fugitive particulate emissions, 12:16702 (RA;US)
Atmospheric Chemistry
Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Combustion
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Single-particle combustion of Beulah lignite char, 12:15332 (BA;US)
Deposition
The mechanism of particulate adhesion in coal-fired gas turbine systems, 12:15679 (R;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Removal
Demonstration, operation, and testing of a fabric filter on an industrial boiler for an extended period of time. Final report, March 1981-November 1982, 12:16717 (R;US)
PARTITION CHROMATOGRAPHY
See CHROMATOGRAPHY
PBFA
See PARTICLE BEAM FUSION ACCELERATOR
PCB
See CHLORINATED AROMATIC HYDROCARBONS
PEACH BOTTOM-2 REACTOR
York County, Pennsylvania, USA
Fuel Assemblies
Performance of boiling water reactor fuel lead test assemblies to 35 MWd/kg U, 12:15780 (J;US)
Reactor Core Disruption
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Summary of core damage frequency from internal initiators: Peach Bottom, 12:16082 (J;US)
Risk Assessment
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Smart approach to level-1 probabilistic risk assessment, 12:16080 (J;US)
Summary of core damage frequency from internal initiators: Peach Bottom, 12:16082 (J;US)
PEACH BOTTOM-3 REACTOR
York County, Pennsylvania, USA
Fuel Assemblies
Performance of boiling water reactor fuel lead test assemblies to 35 MWd/kg U, 12:15780 (J;US)
PEARL SPAR
See DOLOMITE
PEAT
Calorific Value
Recent developments in wet carbonization of peat, 12:15274 (R;US)
Carbonization
Recent developments in wet carbonization of peat, 12:15274 (R;US)
Waste Water
Recent developments in wet carbonization of peat, 12:15274 (R;US)
Water Removal
Recent developments in wet carbonization of peat, 12:15274 (R;US)
PELLETS (FUEL)
See FUEL PELLETS
PEOPLE
See HUMAN POPULATIONS
PEOPLES REPUBLIC OF CHINA
See CHINA

PEPTIDES
Electrophoresis
Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots, 12:16795 (R;US)
Extraction Chromatography
Two-dimensional peptide mapping of protease-digested proteins from two-dimensional electrophoresis gel spots, 12:16795 (R;US)
PERSONNEL
Studies of groups of persons employed in a particular field of endeavor. For studies on individuals in a group see also MAN.
See also REACTOR OPERATORS
Training
New approaches to performance-based project management training, 12:15922 (J;US)
Training requirements for health physicists in the decontamination/decommissioning field, 12:15536 (RA;US)
PERSONNEL DOSIMETRY
Personnel neutron dosimetry using CR-39 foils, 12:16879 (R;US)
Evaluation
Personnel neutron dosimeter evaluation and upgrade program, 12:16875 (RA;US)
Interlaboratory Comparisons
New dose quantities for personnel dosemeters. Results of the intercomparison program 1985 - seminar report, 12:16649 (R;DE;In German)
Recommendations
Technical guidelines for radiological calibrations, 12:16874 (RA;US)
Research Programs
Department of Energy Laboratory Accreditation program for occupational exposure measurements, 12:16877 (RA;US)
PERSONNEL FILM DOSIMETRY
See PERSONNEL DOSIMETRY
PERU
Carbon Cycle
Land use change and carbon exchange in the tropics. I. Detailed estimates for Costa Rice, Panama, Peru, and Bolivia, 12:16765 (J;US)
PETROLEUM
Limited to crude oil; see also COAL LIQUIDS, SHALE OIL, etc.
See also PETROLEUM FRACTIONS
Combustion Properties
Upgrading heavy feedstocks, 12:15361 (J;US)
Cost
Sensitivity analysis of ORION (Replacement cost of petroleum), 12:15362 (R;US)
Energy Models
Sensitivity analysis of ORION (Replacement cost of petroleum), 12:15362 (R;US)
Enhanced Recovery
Potential of enhanced oil recovery, 12:15357 (J;GB)
Market
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Mathematical Models
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Meetings
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Physical Properties
Upgrading heavy feedstocks, 12:15361 (J;US)
Prices
Sensitivity analysis of ORION (Replacement cost of petroleum), 12:15362 (R;US)
World computer model of oil markets: OPEC pricing strategy model in the short and the long run, 12:16170 (R;DE)
Refining
Upgrading heavy feedstocks, 12:15361 (J;US)
Research Programs
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Viscosity
Upgrading heavy feedstocks, 12:15361 (J;US)
PETROLEUM DEPOSITS
Energy Source Development
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Gamma Logging
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Gamma-Gamma Logging
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
Geology
Cenozoic fluctuations in biotic parts of the global carbon cycle, 12:15351 (BA;US)
Simulation experiments with Late Quaternary carbon storage in mid-latitude forest communities, 12:15352 (BA;US)
Leasing
Proposed 5-year Outer Continental Shelf oil and gas leasing program, mid-1987 to mid-1992: Final environmental impact statement: Volume 1, 12:15363 (R;US)
Resistivity Logging
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)
PETROLEUM FRACTIONS
See also PETROLEUM RESIDUES
Mutagen Screening
Complex mixtures: comparative chemical and toxicological characterization, 12:15336 (RA;US)
PETROLEUM INDUSTRY
Hazardous Materials
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)
PETROLEUM RESIDUES
B.P. over 1100°F, 593°C; includes oil residues, residua.
Carcinogen Screening
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Combustion Properties
Upgrading heavy feedstocks, 12:15361 (J;US)
Hydrogenation
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Mass Spectra
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Mixing
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Mutagen Screening
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
NMR Spectra
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Physical Properties
Upgrading heavy feedstocks, 12:15361 (J;US)
Processing
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Refining
Upgrading heavy feedstocks, 12:15361 (J;US)
PETTEN LOW FLUX REACTOR
See LFR REACTOR
PH VALUE
Effects of pH on calcium release from rod outer segment discs, 12:16797 (J;US)
PHANTOMS
Single Photon Emission Computed Tomography
A calibration phantom for absolute quantitation of radionuclide uptake by SPECT, 12:16819 (J;US)

Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)

PHASE CHANGE MATERIALS
Use with the specific phase change material (e.g. calcium chloride) when known.
Computerized Simulation
PCMSOL: Simulation code for a passive solar structure incorporating phase change materials, 12:15622 (R;US)

PHENOL
Viscosity
Viscosity behavior in supercooled pure liquids and mixtures, 12:16407 (R;US)

PHENOLS
See also PHENOL
Biodegradation
Degradation of ortho phenol by streptomycetes in continuous cultures, 12:16828 (RA;US)
Biological Accumulation
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Catabolism
Degradation of ortho phenol by streptomycetes in continuous cultures, 12:16828 (RA;US)
Root Absorption
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)

PHENYLAMINE
See ANILINE

PHENYLETHYLENE
See STYRENE

PHORBOL ESTERS
Toxicity
Action of tumor initiators and promoters in the Syrian hamster embryo cell transformation assay, 12:16902 (RA;US)

PHOSPHATE MINERALS
Nuclear Reaction Analysis
Application of different methods of neutron activation analysis to the determination of trace elements in rock samples, 12:16391 (R;DE)

PHOSPHATES
For salts only; see also PHOSPHORIC ACID ESTERS.
Biological Accumulation
Investigations into the mechanisms of interaction between to microbial populations in activated sludge, 12:16837 (RA;US)
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)

PHOSPHORUS
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)

PHOSPHORUS 31
Diagnostic Uses
In vivo monitoring of line 168 mammary tumors by topical nuclear magnetic resonance, 12:16823 (J;US)

PHOSPHORUS 37
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)

PHOSPHORUS 38
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)

PHOSPHORUS ADDITIONS
Passivation
Passivity of amorphous Ni-Cr-P alloys, 12:16296 (R;US)

PHOSPHORUS COMPLEXES
Catalytic Effects
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Preparation
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Properties
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)

PHOSPHORUS COMPOUNDS
See also PHOSPHATES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Fractionation
Thylakoid phosphoproteins, 12:15598 (R;US)

PHOTOCONDUCTORS
Testing
Characterization of on-chip polycrystalline silicon photoconductors, 12:16492 (R;US)
Uses
GaAs photoconductors to characterize picosecond response in GaAs integrated devices and circuits, 12:16491 (R;US)

PHOTODISINTEGRATION
See PHOTONUCLEAR REACTIONS

PHOTOELECTROCHEMICAL CELLS
Photoanodes
Superlattice photoelectrodes for photoelectrochemical cells, 12:15615 (P;US)
Photocathodes
Superlattice photoelectrodes for photoelectrochemical cells, 12:15615 (P;US)

PHOTOELECTRON SPECTROSCOPY
Uses
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

PHOTOLUMINESCENCE
Time Resolution
Streak camera and picosecond metrology of laser impulses running at high repetitive rates, 12:16602 (R;FR;In French)

PHOTOMAGNETIC EFFECT
See VISIBLE RADIATION

PHOTOMETERS
Design
Technology transfer of kinetic phosphorimetry, 12:16392 (RA;US)

PHOTOMULTIPLIERS
Hodoscopes
Hodoscope photomultipliers and their application in particle detectors, 12:16614 (R;SU;In Russian)

PHOTON ACTIVATION ANALYSIS
See ACTIVATION ANALYSIS, PHOTONS

PHOTON DETECTION (GAMMA)
See GAMMA DETECTION

PHOTON DETECTION (X-RAY)
See X-RAY DETECTION

PHOTON-NEUTRON INTERACTIONS
Photoproduction
Data compilation of single pion photoproduction below 2 GeV, 12:17113 (R;JP)

PHOTON-PROTON INTERACTIONS
Absorption
On the growth of hadronic photoabsorption cross-section, 12:17102 (R;SU)
Photoproduction
Data compilation of single pion photoproduction below 2 GeV, 12:17113 (R;JP)

Total Cross Sections
On the growth of hadronic photoabsorption cross-section, 12:17102 (R;SU)

PHOTONS
See also COSMIC PHOTONS
Multiple Production
Hadronic production of leptons and photons, 12:17137 (RA;CS)

PHOTONUCLEAR REACTIONS
Asymmetry
Experimental method for investigating γd->pn photodisintegration reaction on the linearly polarized photon beam of the Erevan synchrotron, 12:16547 (R;SU;In Russian)

PHOTOPRODUCTION
Pions
Data compilation of single pion photoproduction below 2 GeV, 12:17112 (R;JP)
Pions Minus
Data compilation of single pion photoproduction below 2 GeV, 12:17113 (R;JP)

PHOTOSPHERE
Magnetic Flux
Self-consistent models of solar photospheric magnetic flux concentrations, 12:16947 (RA;CS)

PHOTOSYNTHESIS
Remote Sensing
Relationship between atmospheric CO_2 variations and a satellite-derived vegetation index, 12:16736 (J;GB)
Seasonal Variations
Seasonal patterns of leaf photosynthetic capacity in successional northern hardwood tree species, 12:16805 (J;US)

PHOTOSYNTHETIC REACTION CENTERS
Messenger-RNA
Oxygen-regulated mRNAs for light-harvesting and reaction center complexes and for bacteriochlorophyll and carotenoid biosynthesis in Rhodobacter capsulatus during the shift from anaerobic to aerobic growth, 12:16796 (J;US)

PHOTOVOLTAIC POWER SUPPLIES
Computerized Simulation
PVFORM Version 3.2: a PV simulation program for mini and micro computer systems. Second version, 12:15617 (R;US)
Economic Analysis
Evaluation of international photovoltaic projects: Volume 1, Executive summary, 12:15616 (R;US)
Reviews
Evaluation of international photovoltaic projects: Volume 1, Executive summary, 12:15616 (R;US)

PHWR TYPE REACTORS
See also ATUCHA REACTOR
POINT LEPREAU-1 REACTOR
Neutron Diffusion Equation
BOXER3: a three dimensional integral transport code for PHWR supercell, 12:15837 (R;IN)

PHYCOBILISOMES
Chemical Composition
Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp, 12:16806 (J;US)
Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa, 12:16807 (J;US)
Molecular Structure
Light intensity adaptation and phycobilisome composition of Microcystis aeruginosa, 12:16807 (J;US)
Size
Constant phycobilisome size in chromatically adapted cells of the cyanobacterium Tolypothrix tenuis, and variation in Nostoc sp, 12:16806 (J;US)

PHYSICAL RADIATION EFFECTS
The role of energetic displacement cascades in ion beam modifications of materials, 12:16259 (R;US)
Reviews
Production of freely-migrating defects during irradiation, 12:16250 (R;US)

PHYSICS
See also ATOMIC PHYSICS
HIGH ENERGY PHYSICS
NUCLEAR PHYSICS
REACTOR PHYSICS
SOLID STATE PHYSICS
Education
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Nuclear engineering and health physics fellowship, 1985-1986, 12:15924 (R;US)
Meetings
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
Research Programs
Experimental and theoretical physics. Collection, 12:17189 (R;SU;In Russian)

PIGE ANALYSIS
See NUCLEAR REACTION ANALYSIS
PROMPT GAMMA RADIATION
PROTON REACTIONS

PIGMENT CELLS
See ANIMAL CELLS
PIGMENTS

PIGMENTS
See also CAROTENOIDS
Synthesis
Sheath pigment formation in a blue-green algae lyngbya aestuarii as an adaptation to high light, 12:16832 (RA;US)

PIGS
See SWINE

PINES
Photosynthesis
Carbon dioxide exchange and growth of a pine plantation, 12:16809 (J;NL)
Plant Diseases
Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)
Plant Growth
Carbon dioxide exchange and growth of a pine plantation, 12:16809 (J;NL)
Incidence of fusiform rust infection on loblolly pine related to tip moth damage, 12:16886 (R;US)

PINS (FUEL)
See FUEL PINS

PION MINUS REACTIONS
Isotope Effects
Isotope and isotonic effects in nucleon inclusive production at high energies (sup(6,7)Li, sup(10,11)B, sup(58,64)Ni, sup(112,124)Sn, Cu, Zn, In targets), 12:17198 (R;SU;In Russian)
Nuclear Reaction Yield
Isotope and isotonic effects in nucleon inclusive production at high energies (sup(6,7)Li, sup(10,11)B, sup(58,64)Ni, sup(112,124)Sn, Cu, Zn, In targets), 12:17198 (R;SU;In Russian)

PION MINUS-PROTON INTERACTIONS
Differential Cross Sections
Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)
Particle Production
Differential cross section of the π/sup -/p -> eta/sup 0/Δ/sup 0/(1232) reaction at the momentum of 3.3 Gev/s, 12:17149 (R;SU;In Russian)

PION PLUS REACTIONS
Inclusive Interactions
Observation of energetic protons in coincidence with pion-induced double charge exchange on /sup 12/C and /sup 48/Ca, 12:17212 (J;NL)
Knock-Out Reactions
Quasi-free scattering of pions on nuclei in the region of Δ/sub 33/-resonance, 12:17283 (RA;SU;In Russian)
Quasi-Free Reactions
Quasi-free scattering of pions on nuclei in the region of Δ/sub 33/-resonance, 12:17283 (RA;SU;In Russian)

PION REACTIONS
See also PION MINUS REACTIONS
PION PLUS REACTIONS

Potential Scattering
Dispersive effects in low energy pion-nucleus scattering, 12:17301 (J;NL)

PIONS
Multiplicity
Pion multiplicity in α-nucleus reactions from 200 to 800 A. MeV, 12:17205 (R;FR)
Photoproduction
Data compilation of single pion photoproduction below 2 GeV, 12:17112 (R;JP)

PIPELINES
Heat Losses
Simulation of heat losses and ground temperatures for district-heating culverts. Comparison with field experiments for well-insulated, damaged, and extra-insulated culverts, 12:16227 (R;US)
Hydrogen Embrittlement
Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)
Materials Testing
Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)

PIPES
Acoustic Emission Testing
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Cracks
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Erosion
Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986, 12:15324 (R;US)
In-Service Inspection
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Pressure Drop
Measurements of pressure drop in turbulent pipe flows of highly loaded HDPE slurries, 12:16200 (R;US)
Seismic Effects
Control calculations of seismic effects on pipes using integrated program package, 12:16055 (RA;CS;In Czech)
Systems Analysis
Application of the leak-before-break approach to BWR piping: Final report, 12:16029 (R;US)

PIXE ANALYSIS
Prior to October 1980, this concept was indexed to X-RAY EMISSION ANALYSIS.
Accuracy
Proton exciting X ray analysis. A new technique of trace element analysis in biomedicine, 12:16382 (R;CN;In Chinese)
Reviews
Status of data and data needs for XRF and PIXE based element analysis, 12:16377 (R;IN)
Sensitivity
Proton exciting X ray analysis. A new technique of trace element analysis in biomedicine, 12:16382 (R;CN;In Chinese)

PLACENTA
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)

PLANETARY ATMOSPHERES
Excludes EARTH ATMOSPHERE.
Infrared Spectra
Infrared observations of planetary atmospheres, 12:16985 (RA;US)
Planetary spectroscopy, 12:17005 (RA;US)
Particle Interactions
Secondary production of gamma rays in the Jovian magnetosphere, 12:16937 (RA;US)
Spectra
Planetary submillimeter spectroscopy, 12:16979 (RA;US)

PLANETARY NEBULAE
Expansion
On the mass loss rate by the nuclei of planetary nebulae, 12:16957 (R;SU;In Russian)

PLANETS
See also JUPITER PLANET
MARS PLANET
NEPTUNE PLANET
PLUTO PLANET
SATURN PLANET
URANUS PLANET
VENUS PLANET
Chemical Composition
Research in planetary astronomy, 12:16970 (RA;US)
Detection
Spectroscopic planetary detection, 12:17019 (RA;US)
Infrared Spectra
Physical properties of asteroids, 12:17015 (RA;US)
Research in planetary astronomy, 12:16970 (RA;US)
Laser Spectroscopy
Spectroscopic planetary detection, 12:17019 (RA;US)
Research Programs
Reports of planetary astronomy, 1985, 12:16969 (R;US)
Satellite Atmospheres
Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986, 12:17031 (R;US)

PLANT GROWTH
Mathematical Models
Modeling needs for predicting responses to CO_2 enrichment: plants, communities and ecosystems, 12:16763 (J;NL)
Predicting the response of plants to increasing carbon dioxide: a critique of plant growth models, 12:16764 (J;NL)

PLANTS
See also ALGAE
SOLANUM
TREES
Productivity
Effects of elevated CO_2 on plants. III. Flower, fruit and seed production and abortion, 12:16910 (J;GB)

PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS

PLANTS (POWER)
See POWER PLANTS

PLASMA
See also COLD PLASMA
COLLISIONAL PLASMA
EQUILIBRIUM PLASMA
LASER-PRODUCED PLASMA
Electron Beams
Collective excitation of a target by high-density electron beam, 12:17308 (R;SU;In Russian)
Line Broadening
Spectral line shapes of X-ray dipoler emission in high densities plasmas, 12:17062 (R;FR)
Research Programs
Space plasma research. Final report, August 1980-August 1986, 12:17413 (R;US)
Thermal Conductivity
Short-wave convective turbulence and anomalous electron thermal conductivity of a plasma, 12:17409 (R;SU)
Turbulence
Short-wave convective turbulence and anomalous electron thermal conductivity of a plasma, 12:17409 (R;SU)

PLASMA ACCELERATORS
See PLASMA GUNS

PLASMA DIAGNOSTICS
High power, millimeter-wavelength, coherent radiation sources. Final report, 1 February 1982-31 January 1986, 12:16487 (R;US)
Calibration
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Laser Radiation
Plasma diagnostics: Detection of laser scattering: Final report, September 1, 1978 to August 31, 1982, 12:17400 (R;US)
Neodymium Lasers
Nd:Glass lasers for Thomson scattering plasma diagnostics on the compact toroid transport experiment, 12:17422 (BA;US)
Probes
Neutral beam probe for potential measurements in Phaedrus minimum-B end plug, 12:17421 (BA;US)

Soft X Radiation
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
Thomson Scattering
Nd:Glass lasers for Thomson scattering plasma diagnostics on the compact toroid transport experiment, 12:17422 (BA;US)
PLASMA FOCUS DEVICES
Modifications
Pulsed soft X-ray source for laser plasma diagnostics calibrations, 12:17397 (R;FR)
PLASMA GUNS
Design
Acceleration of compact torus plasma rings in a coaxial rail-gun, 12:17482 (RA;US)
PLASMA HEATING
Tearing Instability
Coronal heating by magnetic tearing turbulence, 12:16948 (RA;CS)
PLASMA MACROINSTABILITIES
See also TEARING INSTABILITY
Astrophysics
Magnetic reconnection in astrophysics, 12:16945 (RA;CS)
PLASMA OSCILLATIONS
See PLASMA WAVES
PLASMA (QUARK)
See QUARK MATTER
PLASMA RINGS
Acceleration
Acceleration of compact torus plasma rings in a coaxial rail-gun, 12:17482 (RA;US)
Performance
Ion ring experiments with applications to the compact toroid program, 12:17480 (RA;US)
PLASMA SWITCHES
Computerized Simulation
Computational modeling of plasma-flow switched foil implosions, 12:16496 (BA;US)
PLASMA WAVES
Mathematical Models
High-frequency broadband emission from turbulent plasmas, 12:17424 (BA;US)
PLASTIC SCINTILLATION COUNTERS
See PLASTIC SCINTILLATION DETECTORS
PLASTIC SCINTILLATION DETECTORS
Pulse Rise Time
Study of light pulse shape from polystyrene scintillators, 12:16615 (R;SU;In Russian)
PLATINUM
Heating
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Reduction
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)
PLATINUM ALLOYS
Phase Studies
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
PLATINUM COMPLEXES
Catalytic Effects
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Chemical Preparation
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Properties
Mediated electrochemical reduction of CO_2. Preparation and comparison of an isoelectronic series of complexes, 12:16421 (J;US)
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Chemical Reactions
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Crystal Structure
Synthesis, characterization, and reactivity of α-ketoacyl complexes of platinum(II) and palladium(II). Crystal structures of trans-$Pt(PPh_3)_2(Cl)(COCOPh)$ and cis-$Pt(PPh_3)_2(COPh)(COOMe)$, 12:16413 (J;US)
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
PLATINUM ISOTOPES
Rotational States
High-spin states and coexisting states in the Pt-Au transition region, 12:17235 (R;US)
PLOWSHARE PROJECT
Political Aspects
Nuclear explosives for peaceful purposes, 12:16683 (R;US)
PLUMES
Mathematical Models
An integral model of plume rise from high explosive detonations, 12:16679 (R;US)
PLUTO PLANET
Eclipse
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Interferometry
Speckle interferometry applied to asteroids and other solar system objects, 12:17004 (RA;US)
Satellites
Research in planetary astronomy and operation of the 2.2-meter telescope, 12:16976 (RA;US)
Sodium
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
PLUTONIUM
Electrorefining
The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor, 12:15383 (R;US)
Hydrolysis
Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
Nuclear Fuels
Interfacing robotics with plutonium fuel fabrication, 12:15377 (R;US)
Recovery
Interfacing solvent extraction in the recovery of pyrochemical residues at the Savannah River Plant, 12:15387 (R;US)
X-Ray Fluorescence Analysis
Online plutonium x-ray fluorescence analyzer system in F-Canyon, 12:15376 (R;US)

PLUTONIUM 238
Spontaneous Fission
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
PLUTONIUM 239
Half-Life
Uncertainties in scientific measurements, 12:17216 (R;US)
Ion Exchange
Recovery of /sup 238/Pu from irradiated /sup 237/Np using anion exchange method, 12:15381 (R;CN;In Chinese)
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
PLUTONIUM 239 TARGET
Neutron Reactions
Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
Uncertainties in scientific measurements, 12:17216 (R;US)
PLUTONIUM 240
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
Spontaneous Fission
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
PLUTONIUM 241
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
PLUTONIUM 241 TARGET
Neutron Reactions
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
PLUTONIUM 242
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
Spontaneous Fission
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
PLUTONIUM 244
Spontaneous Fission
Shell effects in the spontaneous and thermal neutron induced fission of the plutonium isotopes, 12:17247 (RA;CS)
PLUTONIUM ALLOYS
Electronic Structure
Magnetization density of 5 f electrons in ferromagnetic PuSb, 12:16313 (J;US)
Magnetization
Magnetization density of 5 f electrons in ferromagnetic PuSb, 12:16313 (J;US)
PLUTONIUM COMPLEXES
Chemical Reaction Yield
Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
PLUTONIUM COMPOUNDS
See also PLUTONIUM OXIDES
Absorption Spectroscopy
Laser Induced Photoacoustic Spectroscopy for the oxidation specific determination of actinoids in solution, 12:16388 (R;FR;In German)
Solubility
Chemical behaviour of plutonium in natural aquatic systems: Hydrolysis, carbonate complexation and redox reactions, 12:16431 (R;DE;In German)
PLUTONIUM DIOXIDE
Chemical Properties
Chemical behaviour of Np, Pu and Am in various concentrated salt solutions, 12:16429 (R;FR;In German)
Removal
Experimental study of the recovery of plutonium from non-combustible wastes, 12:15429 (R;FR)
PLUTONIUM OXIDES
See also PLUTONIUM DIOXIDE
Multi-Element Analysis
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
PNA
See POLYCYCLIC AROMATIC HYDROCARBONS
PNEUMATIC TRANSPORT
Test Facilities
Advanced research in instrumentation and control technology: Multiphase flow studies, 12:15323 (R;US)
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986, 12:15324 (R;US)
PNL
See BATTELLE PACIFIC NORTHWEST LABORATORIES
POINT CONTACTS
See ELECTRIC CONTACTS
POINT LEPREAU-1 REACTOR
St. John, New Brunswick, Canada
Planning
Financial risk assessment for nuclear generation expansion planning. A utility view, 12:15839 (RA;XA)
Risk Assessment
Financial risk assessment for nuclear generation expansion planning. A utility view, 12:15839 (RA;XA)
POISONS (CHEMICAL)
See HAZARDOUS MATERIALS
POLARIMETERS
On-Line Measurement Systems
Measuring module of an apparatus for polarization analysis of ultracold neutrons on the base of microcomputer, 12:16639 (R;SU;In Russian)
POLARIZED TARGETS
Development of a polarized deuterium target by spin exchange with optically pumped K, 12:16540 (R;US)
Design
Nuclear physics with internal targets in electron storage rings, 12:17203 (R;US)
Fabrication
Thin film coatings which inhibit spin relaxation of polarized potassium atoms, 12:16538 (R;US)
POLICY
See ENERGY POLICY
ENVIRONMENTAL POLICY
POLLUTANTS
Not for radioactive contaminants for which use RADIOACTIVE WASTES or other related terminology.
Environmental Effects
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
Environmental Transport
The combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems, 12:16781 (BA;US)
POLLUTION CONTROL EQUIPMENT
See also BAGHOUSES
ELECTROSTATIC PRECIPITATORS
Calculation Methods
Process fugitive particulates - design methods for enclosures, 12:16703 (RA;US)
Cost
Identification, assessment, and control of fugitive particulate emissions, 12:16702 (RA;US)

Design
Process fugitive particulates - design methods for enclosures, 12:16703 (RA;US)
Recommendations
Identification, assessment, and control of fugitive particulate emissions, 12:16702 (RA;US)
POLOIDAL DIVERTORS
See POLOIDAL FIELD DIVERTORS
POLOIDAL FIELD DIVERTORS
Design
PF coil system comparisons for a compact ignition device, 12:17536 (J;US)
POLONIUM 210
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
POLYACRYLONITRILE
See NITRILES
ORGANIC POLYMERS
POLYAMIDES
Hydraulic Conductivity
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
Rheology
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
Rock-Fluid Interactions
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
POLYCRYSTALS
See also BICRYSTALS
Neutron Diffraction
Application of neutron time-of-flight diffraction to texture studies, 12:16280 (R;SU)
Texture
Application of neutron time-of-flight diffraction to texture studies, 12:16280 (R;SU)
POLYCYCLIC AROMATIC HYDROCARBONS
Biodegradation
Is the ability of microorganisms to degrade polycyclic aromatic hydrocarbons plasmid mediated?, 12:16831 (RA;US)
Carcinogen Screening
Initiation-promotion studies with complex mixtures, 12:15341 (RA;US)
Carcinogenesis
Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Gas Chromatography
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Hydrogenation
Determination of chemical properties and toxicologic activity of hydroaromatic species in coal liquefaction products, 12:15292 (RA;US)
Infrared Spectra
Infrared absorption and emission characteristics of interstellar PAHs [Polycyclic Aromatic Hydrocarbon], 12:16941 (R;US)
Laser Spectroscopy
Laser analysis of directly injected supercritical fluids, 12:16394 (RA;US)
Metabolism
Factors affecting the carcinogenicity of inhaled particle-organic mixtures, 12:16894 (RA;US)
Metabolism of polycyclic aromatic hydrocarbons in coal-derived complex mixtures applied to mouse skin, 12:15335 (RA;US)
Metabolism of chemical mixtures by the lower respiratory tract, 12:16890 (RA;US)
Mutagen Screening
Genotoxic effects of binary mixtures of polycyclic aromatic hydrocarbons, 12:16899 (RA;US)
Petroleum resid/coal co-processing feeds and product streams: Chemical and toxicological analysis, 12:15295 (R;US)
Mutagenesis
Effects of highly aromatic complex chemical mixtures on the mutagenicity of amino-PAH, nitro-PAH and the intercalating agent, ICR191, 12:15343 (RA;US)
Personnel Dosimetry
Monitoring exposure to polynuclear aromatic compounds via room temperature phosphorescence from solid substrates, 12:15345 (J;GB)
Phosphorescence
Monitoring exposure to polynuclear aromatic compounds via room temperature phosphorescence from solid substrates, 12:15345 (J;GB)
Resonance Ionization Mass Spectroscopy
Laser analysis of directly injected supercritical fluids, 12:16394 (RA;US)
Toxicity
Metabolism of chemical mixtures by the lower respiratory tract, 12:16890 (RA;US)
POLY(ISOBUTYLENE OXIDE)
See EPOXIDES
ORGANIC POLYMERS
POLYMER FLOODING
See MICROEMULSION FLOODING
WATERFLOODING
POLYNUCLEAR AROMATIC HYDROCARBONS
See POLYCYCLIC AROMATIC HYDROCARBONS
POLYSACCHARIDES
Hydraulic Conductivity
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
Rheology
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
Rock-Fluid Interactions
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)
POLYSULFIDES
See SULFIDES
POLYTETRAOXANE
See ORGANIC POLYMERS
POLYTHIONATES
See OXYGEN COMPOUNDS
SULFUR COMPOUNDS
POLYTHIONIC ACIDS
See OXYGEN COMPOUNDS
SULFUR COMPOUNDS
POLY(VINYLIDENE FLUORIDE)
See POLYVINYLS
POLYVINYLS
Aging
The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)
Corrosion
The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)
Temperature Effects
The aging correlation (RH + t): Relative humidity (%) + temperature (°C), 12:15605 (R;US)
PONDS (COOLING)
See COOLING PONDS
POROSIMETERS
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
PORTLAND CEMENT
Leaching
Relationship between leaching of trace elements (Cs, Sr and Co) and microstructure during aging of a mortar with a matrix of artificial Portland cement, 12:16350 (R;FR;In French)

Microstructure
Relationship between leaching of trace elements (Cs, Sr and Co) and microstructure during aging of a mortar with a matrix of artificial Portland cement, 12:16350 (R;FR;In French)

POSITION SENSITIVE DETECTORS
Multiwire Proportional Chambers
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 12:16652 (J;NL)
Si Semiconductor Detectors
Detection of charged particles in amorphous silicon layers, 12:16655 (J;NL)
Performance of a novel silicon detector, 12:16660 (J;NL)

POSITRON BEAMS
Beam Transport
High intensity positron beam and angular correlation experiments at Livermore, 12:16312 (BA;US)

POSITRONIUM
High intensity positron beam and angular correlation experiments at Livermore, 12:16312 (BA;US)
Beam Production
Relativistic positronium channel at the IHEP accelerator, 12:16555 (R;SU;In Russian)
Resonance
Scalar magnetic (e/sup +/e/sup -/) resonance as possible source of an anomalous e/sup +/ peak in heavy-ion collisions, 12:17084 (J;NL)

POSITRONS
Annihilation
A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation, 12:16307 (BA;US)
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
PAS determination of the vacancy formation enthalpy in tungsten, 12:16310 (BA;US)
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)
Diffusion
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)
Trapping
A positron annihilation doppler broadening study of niobium, 12:16309 (BA;US)
A study of the equilibrium vacancy ensemble in aluminum using 1D- and 2D-angular correlation of annihilation radiation, 12:16307 (BA;US)
Methane-bubble formation in hydrogen-charged Fe-30 ppm C, 12:16311 (BA;US)
PAS determination of the vacancy formation enthalpy in tungsten, 12:16310 (BA;US)
Vacancies in thermal equilibrium in Nb, 12:16308 (BA;US)

POSTULATED PARTICLES
See also GLUONS
HIGGS BOSONS
MAGNETIC MONOPOLES
PREONS
QUARKS
Particle Production
Production of mirror fermions near the Z/sup 0/ peak, 12:17156 (J;NL)

POTABLE WATER
See DRINKING WATER

POTASSIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Spin-Spin Relaxation
Thin film coatings which inhibit spin relaxation of polarized potassium atoms, 12:16538 (R;US)
X-Ray Fluorescence Analysis
X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria, 12:16374 (R;IN)

POTASSIUM 39
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)

POTASSIUM 41
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)

POTASSIUM 41 BEAMS
Secondary Beams
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)

POTASSIUM COMPOUNDS
See also POTASSIUM FLUORIDES
POTASSIUM OXIDES
Phase Transformations
The role of point defects on structural phase transitions: Progress report for the year 1986-1987 (Li-doped $KMnF_3$, $KZnF_3$; $K(Ta,Nb)O_3$), 12:16355 (R;US)

POTASSIUM FLUORIDES
Phase Transformations
The role of point defects on structural phase transitions: Progress report for the year 1986-1987 (Li-doped $KMnF_3$, $KZnF_3$; $K(Ta,Nb)O_3$), 12:16355 (R;US)

POTASSIUM OXIDES
Catalytic Effects
Steam gasification of carbonaceous solids catalyzed by a mixture of potassium and nickel oxides below 1000 K, 12:15297 (J;US)

POWER DEMAND
Forecasting
Industrial end-use planning methodology (INDEPTH): Demonstration of design: Volume 1, Econometric forecasting models: Interim report, 12:16182 (R;US)

POWER DISTRIBUTION
D Codes
Program for smooth approximation of a function of two variables, 12:15961 (R;SU;In Russian)

POWER GENERATION
See also COGENERATION
Environmental Effects
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)

POWER PLANTS
See also DUAL-PURPOSE POWER PLANTS
FUEL CELL POWER PLANTS
GAS TURBINE POWER PLANTS
THERMAL POWER PLANTS
THERMONUCLEAR POWER PLANTS
WIND POWER PLANTS
Decommissioning
Deconning during the 1984 H.B. Robinson steam generator replacement project, 12:15523 (RA;US)
Decontamination
Deconning during the 1984 H.B. Robinson steam generator replacement project, 12:15523 (RA;US)

POWER REACTORS
See also ATUCHA REACTOR
BEAVER VALLEY-1 REACTOR
BEAVER VALLEY-2 REACTOR
BRUNSWICK-1 REACTOR
BRUNSWICK-2 REACTOR
CATAWBA-1 REACTOR
CATAWBA-2 REACTOR
CHERNOBYLSK-1 REACTOR
CHERNOBYLSK-4 REACTOR
CRYSTAL RIVER-3 REACTOR
DIABLO CANYON-1 REACTOR
DIABLO CANYON-2 REACTOR
DUKOVANY V-2 REACTOR
EBR-2 REACTOR
GENTILLY REACTOR
GRAND GULF-1 REACTOR
HARRIS-1 REACTOR
INDIAN POINT-2 REACTOR
LA SALLE COUNTY-1 REACTOR
LA SALLE COUNTY-2 REACTOR
LACBWR REACTOR
LUCIE-2 REACTOR
MC GUIRE-1 REACTOR
NINE MILE POINT-1 REACTOR

N-REACTOR
OCONEE-1 REACTOR
OCONEE-2 REACTOR
OYSTER CREEK-1 REACTOR
PAKS-2 REACTOR
PALO VERDE-1 REACTOR
PEACH BOTTOM-2 REACTOR
PEACH BOTTOM-3 REACTOR
RIVER BEND-1 REACTOR
RIVER BEND-2 REACTOR
SAN ONOFRE-1 REACTOR
SEFOR REACTOR
SEQUOYAH-1 REACTOR
SHIPPINGPORT REACTOR
SIZEWELL-B REACTOR
SOUTH TEXAS PROJECT-1 REACTOR
SOUTH TEXAS PROJECT-2 REACTOR
SPACE POWER REACTORS
SURRY-1 REACTOR
SURRY-2 REACTOR
SURRY-3 REACTOR
SURRY-4 REACTOR
TARAPUR-1 REACTOR
TARAPUR-2 REACTOR
THREE MILE ISLAND-2 REACTOR
VOGTLE-1 REACTOR
VOGTLE-2 REACTOR

Breeding Blankets
Applications of the Aqueous Self-Cooled Blanket concept, 12:17516 (J;US)

Cost
Indian experience in investment cost in Small Size Nuclear Power Reactor Units, 12:15886 (RA;XA)

Economics
Analysis of the invited countries questionnaire responses, 12:15879 (RA;XA)
Presentation of the SMPR study (Small and medium power reactors (100-500 MWe)), 12:15883 (RA;XA)
Presentation of main results of Phase I of the SMPR project initiation study, 12:15877 (RA;XA)

Feasibility Studies
Interregional technical co-operation project on small and medium power reactors, 12:15880 (RA;XA)

Financing
Presentation of the SMPR study (Small and medium power reactors (100-500 MWe)), 12:15883 (RA;XA)
Presentation of the purpose of the meeting, 12:15876 (RA;XA)

Investment
Indian experience in investment cost in Small Size Nuclear Power Reactor Units, 12:15886 (RA;XA)

Market
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)

Meetings
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)

Planning
Small and medium power reactors 1985. Report of two meetings on small and medium power reactors: A scientific afternoon held on 25 September 1985 and technical committee meeting held on 26 September 1985. Both meetings were held in Vienna during the General Conference of the IAEA, 12:15871 (R;XA)

Reactor Operators
Human approach to process control and the provision of predictive information, 12:16069 (J;US)

Reactor Safety
Human approach to process control and the provision of predictive information, 12:16069 (J;US)

POWER SYSTEMS
Includes electric power networks with associated generating and transmission facilities.
See also DC SYSTEMS

Cost Estimation
Introduction to cost-effectiveness analysis of risk reduction measures in energy systems, 12:15904 (R;XA)

Electrical Insulation
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)

Electromagnetic Pulses
Simulation of geomagnetic currents induced in a power system by magnetohydrodynamic electromagnetic pulses, 12:15666 (R;US)

Risk Assessment
Introduction to cost-effectiveness analysis of risk reduction measures in energy systems, 12:15904 (R;XA)

Stability
Extended transient-midterm stability package: User's manual for the power flow program: Computer code manual, 12:15756 (R;US)
Extended transient-midterm stability package: Test case manual: Computer code manual, 12:15758 (R;US)
Extended transient-midterm stability package: Support programs technical guide: Computer code manual, 12:15757 (R;US)
Extended transient-midterm stability package: Technical guide for the stability program: Computer code manual, 12:15754 (R;US)
Extended transient-midterm stability package: A user's manual for the stability, output analysis, and transient equivalent grouping programs: Computer code manual, 12:15755 (R;US)
Extended transient-midterm stability package: Final report, 12:15759 (R;US)

Vulnerability
Assess the impact of the steep-front, short duration impulse on electric power system insulation: Phase 1, Final report, 12:15668 (R;US)

POWERED SUPPORTS

Monitoring
System for automatic monitoring of longwall supports at Angus Place colliery, 12:15321 (R;AU)

PRASEODYMIUM

Emission Spectroscopy
Determination of La, Ce, Pr and Nd in carbon steels by optical emission spectroscopy (OES), 12:16379 (R;IN)

PRECIPITATIONS (ATMOSPHERIC)
See ATMOSPHERIC PRECIPITATIONS

PRECOMPOUND-NUCLEUS EMISSION

Gamma Radiation
Neutron-gamma coincidence calculations within the pre-equilibrium model, 12:17273 (RA;CS)

PREEQUILIBRIUM NUCLEAR PROCESSES
See PRECOMPOUND-NUCLEUS EMISSION

PREONS

Bag Model
Bag model from the preons, 12:17150 (R;SU;In Russian)

PRESSURE SUPPRESSION

Computerized Simulation
TRACB04 study on suppression pool swelling during containment venting, 12:16092 (J;US)

PRESSURE VESSELS

Materials Testing
Flaw density examinations of a clad boiling water reactor pressure vessel segment, 12:15763 (R;US)

Neutron Dosimetry
Analyses of solid-state track recorder pressure vessel neutron dosimetry, 12:15951 (J;US)

Neutron Flux
Fast neutron fluxes in pressure vessels using Monte Carlo methods, 12:15822 (J;US)

Physical Radiation Effects
Monitoring radiation damage of reactor structural materials, 12:15949 (RA;CS;In Czech)

Seismic Effects
Dynamic response of nuclear power plant generating unit at simulated seismic excitation, 12:16045 (RA;CS;In Czech)

PRESSURIZED HEAVY WATER COOLED MODERATED
See PHWR TYPE REACTORS

PRESSURIZED WATER COOLED MODERATED REACTO
See PWR TYPE REACTORS
PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS
PRESSURIZERS
Computer-Aided Design
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Sizing
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
PRIMARY COOLANT CIRCUITS
Decontamination
Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)
Failures
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Gamma Detection
Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Level Indicators
Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Pipes
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Pumps
The development of a cavitation free sodium pump for the breeder reactor, 12:15851 (R;US)
Seismic Effects
Earthquake resistance problems of primary circuit components, 12:16041 (RA;CS;In Czech)
Shock Absorbers
Protection of WWER type primary loops against extreme effects, 12:16054 (RA;CS;In Czech)
PRIMATES
See also MAN
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
PROBABILISTIC ESTIMATION
Principles and techniques of data evaluation, 12:17651 (R;DE)
PROBES
Performance Testing
Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
PROCESSING (DATA)
See DATA PROCESSING
PROCESSING (WASTES)
See WASTE PROCESSING
PROCUREMENT
Competition
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)
PRODUCTION (HYDROGEN)
See HYDROGEN PRODUCTION
PRODUCTION (PAIR)
See PAIR PRODUCTION
PROGRAM MANAGEMENT
Planning
A stochastic approach to project planning in an R and D environment: Final report, 12:17633 (R;US)
PROJECT MANAGEMENT
See PROGRAM MANAGEMENT
PROJECT (PLOWSHARE)
See PLOWSHARE PROJECT
PROJECTORS (SCANNING)
See SCANNING MEASURING PROJECTORS
PROMINENCES (SOLAR)
See SOLAR PROMINENCES
PROMPT GAMMA RADIATION
Neutron Reactions
Experimental study of γ-ray emission from neutron resonance fission of /sup 235/U, 12:17250 (RA;CS)
PRONGS
See PARTICLE TRACKS
PROPANE
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
Adsorption
Diffusion of gases in New Mexico coals: Final technical report, 12:15305 (R;US)
PROPORTIONAL COUNTERS
See also MULTIWIRE PROPORTIONAL CHAMBERS
Fluctuations
Sources for proportional tube gain variation: What to do about it, 12:16611 (R;US)
Gases
Development of high pressure proportional counters, 12:16654 (J;NL)
PROTECTION (RADIATION)
See RADIATION PROTECTION
PROTECTIVE COATINGS
Chemical Composition
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)
Corrosion Resistance
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)
Decontamination
Experimental study of the recovery of plutonium from non-combustible wastes, 12:15429 (R;FR)
Failures
Thermal barrier coating life prediction model development. Annual report, 12:16332 (R;US)
Materials Testing
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)
Sales
Results of 1984 architectural coatings sales survey. Final report, 12:16727 (R;US)
Service Life
Thermal barrier coating life prediction model development. Annual report, 12:16332 (R;US)
Thickness
Protective coatings and claddings: Application/evaluation (Coatings were applied by chromizing, aluminizing, or simultaneously aluminizing/chromizing pack-diffusion processes), 12:15272 (R;US)
PROTEINS
See also ACTIN
PEPTIDES
Biophysics
Scaling in biological nuclear magnetic resonance spectral distributions, 12:16817 (J;US)
Nuclear Magnetic Resonance
Scaling in biological nuclear magnetic resonance spectral distributions, 12:16817 (J;US)
PROTON BEAMS
Acceleration
Two-stage acceleration system of high intensity proton beam up to energy of 1 GeV using U-240 isochronous cyclotron, 12:16512 (R;SU;In Russian)

Beam Extraction
High-intensity proton beam formed onto internal target of the IHEP accelerator, 12:16553 (R;SU;In Russian)
Beam Monitoring
On the proton beam characteristic detection in a cyclotron on multiple beam passage through a target, 12:16558 (RA;SU;In Russian)

PROTON REACTIONS
Cross Sections
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
Energy-Level Density
Nuclear level density from analysis of neutron spectra from (n,n') and (p,n) reactions, 12:17277 (RA;CS)
Inelastic Scattering
Random phase approximation, 12:17286 (R;FR)
Isotope Effects
Isotope and isotonic effects in nucleon inclusive production at high energies (sup(6,7)Li, sup(10,11)B, sup(58,64)Ni, sup(112,124)Sn, Cu, Zn, In targets), 12:17198 (R;SU;In Russian)
Nuclear Fireball Model
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Nuclear Reaction Yield
Excitation of target residues in the firestreak model, 12:17289 (R;SU)
Inclusive cross sections of π/sup +/, p, /sup 2/H, /sup 3/H, /sup 3/He yields at angle 3.5 deg in 6.37 and 8.08 GeV/c proton interactions with Be, Al, Cu, Ta nuclei, 12:17197 (R;SU;In Russian)
Isotope and isotonic effects in nucleon inclusive production at high energies (sup(6,7)Li, sup(10,11)B, sup(58,64)Ni, sup(112,124)Sn, Cu, Zn, In targets), 12:17198 (R;SU;In Russian)
Scattering
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)
Semiclassical Approximation
Random phase approximation, 12:17286 (R;FR)
Three-Body Problem
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)

PROTON-ANTIPROTON INTERACTIONS
Differential Cross Sections
Analysis of elastic scattering in anti pp interactions at 22.4 GeV/c, 12:17117 (R;SU;In Russian)
Elastic Scattering
Analysis of elastic scattering in anti pp interactions at 22.4 GeV/c, 12:17117 (R;SU;In Russian)
Jets
High transverse-momentum jets, 12:17136 (RA;CS)
Particle Production
Hyperon-antihyperon production studies near threshold at LEAR, 12:17098 (R;US)

PROTON-INDUCED X-RAY EMISSION ANALYSIS
See PIXE ANALYSIS

PROTON-PROTON INTERACTIONS
Jet Model
Fragmentation of jets produced in hard p anti p collisions at the ISR, 12:17119 (R;DK)
Study of gluon scattering and gluon fragmentation in high P/sub T/ interactions at the ISR, 12:17121 (J;DE)
Jets
High transverse-momentum jets, 12:17136 (RA;CS)
Particle Production
Bottom quark production at the SSC [Superconducting Super Collider], 12:17124 (R;US)
Polarized Products
Experimental results on spin physics at the AGS, 12:17096 (R;US)

PROTONS
See also SOLAR PROTONS
Differential Cross Sections
Multiple target ionization by proton impact, 12:17319 (RA;US)
Magnetic Moments
Model of nonrelativistic quarks in self-consistent field, 12:17130 (R;SU;In Russian)
Particle Production
Some topological characteristics of π/sup -/meson interactions with nuclei, 12:17199 (R;SU;In Russian)
Study on the K/sup +/p -> Λ + p + X reaction at 32 GeV/c, 12:17104 (R;SU;In Russian)
Photoproduction
Measurement of the polarization of cumulative protons in γA -> pX reaction, 12:17101 (R;SU)
Total Cross Sections
Multiple target ionization by proton impact, 12:17319 (RA;US)

PSI-3105 RESONANCES
Particle Production
Leptoproduction of nuclei as an analogue to production in hadron-hadron interactions (at the example of J/psi), 12:17131 (R;SU)

PULMONARY CANCER
See CARCINOMAS

PULMONARY LAVAGE
See LUNGS

PULPS
See SLURRIES

PULSARS
Stellar Magnetospheres
Axisymmetric pulsar magnetosphere, 12:16951 (RA;CS)

PULSE GENERATORS
See also HIGH-VOLTAGE PULSE GENERATORS
Photoconductors
GaAs photoconductors to characterize picosecond response in GaAs integrated devices and circuits, 12:16491 (R;US)

PULVERIZED FUEL ASH
See FLY ASH

PULVERIZED FUELS
Combustion
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln, 12:15314 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 1. Technical report. Final report, June 1983-September 1985, 12:15315 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 2. Data supplement A. Final report, June 1983-September 1985, 12:15316 (R;US)
Evaluation of primary air vitiation for nitric oxide reduction in a rotary cement kiln. Volume 3. Data supplement B. Final report, June 1983-September 1985, 12:15317 (R;US)

PUMPS
Cracks
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
Materials Testing
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Mechanical Vibrations
Detection of incipient failure in vertical pumps, 12:15687 (RA;US)
Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Vibration monitoring/diagnostic techniques, as applied to reactor coolant pumps, 12:15823 (J;US)
Seals
Monitoring and diagnostic system for reactor coolant pump seals, 12:15947 (RA;US)
Reactor coolant pump seal leakage monitoring, 12:15946 (RA;US)
Shafts
Vibration monitoring/diagnostic techniques, as applied to reactor coolant pumps, 12:15823 (J;US)

Two-Phase Flow
Correlation technique for single- and two-phase pump data, 12:15953 (J;US)
PUREX PROCESS
High-Level Radioactive Wastes
Process facility modifications project, 12:15393 (J;US)
Modifications
Process facility modifications project, 12:15393 (J;US)
PURITY
See IMPURITIES
PWR TYPE REACTORS
See also BEAVER VALLEY-1 REACTOR
BEAVER VALLEY-2 REACTOR
CATAWBA-1 REACTOR
CATAWBA-2 REACTOR
CRYSTAL RIVER-3 REACTOR
DIABLO CANYON-1 REACTOR
DIABLO CANYON-2 REACTOR
DUKOVANY V-2 REACTOR
HARRIS-1 REACTOR
INDIAN POINT-2 REACTOR
LOFT REACTOR
LUCIE-2 REACTOR
MC GUIRE-1 REACTOR
OCONEE-1 REACTOR
OCONEE-2 REACTOR
PALO VERDE-1 REACTOR
QINSHAN REACTOR
SAN ONOFRE-1 REACTOR
SEQUOYAH-1 REACTOR
SHIPPINGPORT REACTOR
SIZEWELL-B REACTOR
SOUTH TEXAS PROJECT-1 REACTOR
SOUTH TEXAS PROJECT-2 REACTOR
SURRY-1 REACTOR
SURRY-2 REACTOR
SURRY-3 REACTOR
SURRY-4 REACTOR
THREE MILE ISLAND-2 REACTOR
VOGTLE-1 REACTOR
VOGTLE-2 REACTOR
WESTINGHOUSE STANDARD REACTOR
WWER TYPE REACTORS
Capitalized Cost
Concept of prudence and its impact, 12:16180 (J;US)
Computerized Simulation
Use of the DSNP simulation language in high-seed dynamic simulation of nuclear power plants, 12:15830 (J;US)
Construction
Concept of prudence and its impact, 12:16180 (J;US)
Containment Systems
Summary of PWR leak detection studies, 12:16093 (J;US)
Cost Estimation
Introduction to cost-effectiveness analysis of risk reduction measures in energy systems, 12:15904 (R;XA)
Design
Bechtel automated control of design document data, 12:15820 (J;US)
Design Basis Accidents
Modeling of Ge(Li) gamma-ray spectra, 12:16126 (J;US)
ECCS
Loss of pressurizer water level during station blackout, 12:16123 (J;US)
Engineered Safety Systems
Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
Failed Element Detection
LWR Fuel failure detection using the grip sipping method, 12:15779 (J;US)
Fuel Cans
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
Fuel Elements
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Fuel Management
Application of high-burnup experience to consolidation equipment design, 12:15782 (J;US)
Impact of high-burnup fuel cycles on fuel storage systems, 12:15808 (J;US)
Fuel Rods
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Fuel-Cladding Interactions
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Heat Transfer
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
Hydraulics
Abnormal transients in nuclear power plants, Atlanta, Georgia, April 12-15, 1987, 12:15792 (J;US)
Algorithms for the solution of the mixture drift-flux equations on multi-CPU vector pipeline machines, 12:15789 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Thermal-hydraulic issues in nuclear training, 12:15791 (J;US)
Inconel 600
Understanding and protecting steam generator materials, 12:15813 (J;US)
Loss of Coolant
Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2, 12:16087 (J;US)
Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident, 12:16086 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Modifications and assessment of rewetting correlations for light water reactor system analysis, 12:16134 (J;US)
Numerical simulation of PWR response to a small break LOCA [loss-of-coolant accident] with reactor coolant pumps operating, 12:16026 (R;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Simulation experiments for hot-leg U-bend two-phase flow phenomena, 12:16018 (R;US)
TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)
TREAT source-term experiment STEP-1 simulating a PWR LOCA, 12:16106 (J;US)
Materials Handling Equipment
Application of high-burnup experience to consolidation equipment design, 12:15782 (J;US)
Nuclear Fuels
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Outages
Loss of pressurizer water level during station blackout, 12:16123 (J;US)
Pressure Vessels
Fast neutron fluxes in pressure vessels using Monte Carlo methods, 12:15822 (J;US)

Pressurizers
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Primary Coolant Circuits
Acoustic emission/flaw relationship for in-service monitoring of nuclear pressure vessels: Progress report, April 1986-September 1986, 12:15773 (R;US)
Decontamination by water jet, chemical and electrochemical methods, 12:15772 (R;FR;In French)
Ex-core water-level monitor: comparison of computations with LOFT data, 12:16121 (J;US)
Flow visualization study of inverted U-bend two-phase flow, 12:16017 (R;US)
Loss of pressurizer water level during station blackout, 12:16123 (J;US)
R Codes
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Radioactive Waste Management
Operating a transportable volume reduction and solidification system (TVR-III), 12:15468 (J;US)
Reactor Accidents
Calculations for determining appropriate key radionuclides for failed fuel analysis, 12:15827 (J;US)
Effect of hygroscopicity on aerosol behavior, 12:16103 (J;US)
Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
Experimental determination of the partition coefficient of HOI, 12:16104 (J;US)
QUASAR: a methodology for quantification of uncertainties in severe-accident source terms, 12:16102 (J;US)
Quasar uncertainty study, 12:16004 (R;US)
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Components
Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)
Synthesizing seismic fragility of components by use of existing data, 12:16006 (R;US)
Reactor Control Systems
Backfit of advanced technology to improve plant operability and maneuverability, 12:15964 (J;US)
Reactor Cooling Systems
An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Core Disruption
Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme, 12:16034 (R;FR)
Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Calculations for determining appropriate key radionuclides for failed fuel analysis, 12:15827 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1, 12:16141 (J;US)
Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)
Fuel performance and fission product release during loss of coolant and severe fuel damage accidents, 12:16022 (R;CA)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Reactor Cores
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Backfit of advanced technology to improve plant operability and maneuverability, 12:15964 (J;US)
Countercurrent flow and flooding with abrupt area changes, 12:15793 (J;US)
Prediction of transient axial power distribution for calculation of the DNBR limit, 12:15794 (J;US)
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)
Reactor Kinetics
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Reactor Materials
Aging degradation of cast stainless steel, 12:15765 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
Reactor Monitoring Systems
Backfit of advanced technology to improve plant operability and maneuverability, 12:15964 (J;US)
Reactor Operation
Long-range goal setting in the nuclear utility industry, 12:15787 (J;US)
U-tube steam generator model for the DSNP language, 12:15831 (J;US)
Reactor Physics
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
Reactor Safety
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Comparison of Lehigh 3 x 3 rod bundle post-CHF data with the predictions of RELAP5/MOD2, 12:16087 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Dispersed-flow heat transfer during reflood in a pressurized water reactor after a large-break loss-of-coolant accident, 12:16086 (J;US)
Effect of bubbly/slug interfacial shear on liquid carryover predicted by RELAP5/MOD2 during reflooding, 12:16135 (J;US)
Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Loss of pressurizer water level during station blackout, 12:16123 (J;US)
Sensitivity study for LOFT analyses with COBRA/TRAC to determine the effect of initial fuel storage energy, 12:16094 (J;US)
Summary of PWR leak detection studies, 12:16093 (J;US)
TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)
TREAT source-term experiment STEP-1 simulating a PWR LOCA, 12:16106 (J;US)
Use of the Chen boiling heat transfer correlation in once-through steam generator analysis, 12:16089 (J;US)
Reactor Safety Experiments
Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1, 12:16141 (J;US)
Reactor Shutdown
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Summary of safety relief valve position indication systems, 12:16119 (J;US)
Reactor Simulators
LWR system simulation and transient analysis package on the Oregon State cyber-VE, 12:15790 (J;US)

Relief Valves
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Summary of safety relief valve position indication systems, 12:16119 (J;US)
Risk Assessment
Introduction to cost-effectiveness analysis of risk reduction measures in energy systems, 12:15904 (R;XA)
Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
Scram
Improvement in steam generator level control, 12:15817 (J;US)
Secondary Coolant Circuits
Improved water chemistry controls for minimizing degradation of materials, 12:15811 (J;US)
Review of secondary side tube degradation processes in PWR steam generators, 12:15812 (J;US)
Soil-Structure Interactions
SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
Specifications
Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
Spent Fuel Elements
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Finite difference solution procedure for convection-diffusion problems in irregular geometries, 12:16480 (J;US)
Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities, 12:15402 (J;US)
Spent Fuel Storage
Impact of high-burnup fuel cycles on fuel storage systems, 12:15808 (J;US)
Optimization of spent-fuel storage equipment with extended burnup, 12:15781 (J;US)
Steam Generators
Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report, 12:15771 (R;US)
Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Improved water chemistry controls for minimizing degradation of materials, 12:15811 (J;US)
Improvement in steam generator level control, 12:15817 (J;US)
Primary side stress corrosion cracking and remedial measures, 12:15809 (J;US)
Review of secondary side tube degradation processes in PWR steam generators, 12:15812 (J;US)
Steam generator vessel and feedwater line integrity issues, 12:15810 (J;US)
Understanding and protecting steam generator materials, 12:15813 (J;US)
Use of the Chen boiling heat transfer correlation in once-through steam generator analysis, 12:16089 (J;US)
Systems Analysis
Analysis of reactor trips involving balance-of-plant failures, 12:16100 (J;US)
Transients
An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)
Turbines
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Equipment and procedural modifications to improve the reliability of Terry turbines used in nuclear service, 12:15785 (J;US)

PWR
41 TYPE REACTORS
See WESTINGHOUSE STANDARD REACTOR

PYRIMIDINE DIMERS
Molecular Biology
Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers, 12:16882 (J;US)
Radioinduction
Quantitation of radiation-, chemical-, or enzyme-induced single strand breaks in nonradioactive DNA by alkaline gel electrophoresis: application to pyrimidine dimers, 12:16882 (J;US)

PYROLYSIS
Chemical Reaction Yield
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Chemical Reactors
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Meetings
Proceedings: 1985 international conference on coal science, 12:15267 (B;AU)
Yields
Expansion of high-temperature; high-pressure data set for coal gasification. Fourth quarterly report, June 28-September 28, 1985, 12:15278 (R;US)

PYROLYSIS PRODUCTS
See also CHARS
Gas Chromatography
Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)
Mass Spectroscopy
Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)

PYROXENES
See also DIOPSIDE
Cobalt
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)
Nickel
Thermochemical study of the distribution of cobalt and nickel between diopsidic pyroxene and melt, 12:16931 (J;US)

PZT
Deposition
Effects of hydrolysis on metallo-organic solution deposition of PZT [lead zirconate titanate] films, 12:16347 (R;US)

Q

QINSHAN REACTOR
Near Shanghai, China.
Construction
Background for and experience with Qinshan project in China, 12:15874 (RA;XA)
Planning
Background for and experience with Qinshan project in China, 12:15874 (RA;XA)

QUADRUPOLE LINACS
Electromagnetic Fields
Systematic errors in field measurements in a hf quadrupole focusing accelerator, 12:16524 (R;SU;In Russian)

QUANTUM CHROMODYNAMICS
Bag Model
Is it necessary to prove the "potential" confinement in QCD, 12:17174 (R;SU;In Russian)
Chiral Symmetry
More on the first order chiral symmetry transition in QCD, 12:17160 (R;US)
Hard Collision Models
QCD and hard quark and gluon scattering, 12:17138 (RA;CS)
Infrared Divergences
Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory, 12:17170 (R;SU)

Instantons
Multiinstantons and monopoles in SU(2) gluodynamics, 12:17166 (R;SU)
Magnetic Moments
Tests of QCD in high energy spin reactions, 12:17123 (R;US)
Magnetic Monopoles
Multiinstantons and monopoles in SU(2) gluodynamics, 12:17166 (R;SU)
Monte Carlo Method
Solving QCD using Monte Carlo Renormalization Group method, 12:17182 (R;US)
Renormalization
Solving QCD using Monte Carlo Renormalization Group method, 12:17182 (R;US)
Spin Flip
Tests of QCD in high energy spin reactions, 12:17123 (R;US)
Supersymmetry
Gluon bremsstrahlung in supersymmetric QCD, 12:17148 (R;SU;In Russian)
Wilson Loop
Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory, 12:17170 (R;SU)

QUANTUM ELECTRODYNAMICS
Space Charge
Relativistic theory of forming space charge laminar flows, 12:17178 (R;SU;In Russian)

QUANTUM FIELD THEORY
See also LATTICE FIELD THEORY
QUANTUM CHROMODYNAMICS
QUANTUM ELECTRODYNAMICS
QUANTUM GRAVITY
Conformal Invariance
Energy-momentum tensor on a Riemann surface, 12:17183 (J;NL)
Energy-Momentum Tensor
Energy-momentum tensor on a Riemann surface, 12:17183 (J;NL)
Fock Representation
Fock representation for quaternion fields, 12:17173 (R;SU;In Russian)
Renormalization
Quantum field theory renormalization in curved space-time and renormalization group equations, 12:17167 (R;SU;In Russian)
Quantum principles in field interactions, 12:17172 (R;SU;In Russian)
Supermultiplets
On the anomalous supermultiplet in th Wess-Zumino model, 12:17164 (R;SU;In Russian)
Supersymmetry
On the anomalous supermultiplet in th Wess-Zumino model, 12:17164 (R;SU;In Russian)
Quantum principles in field interactions, 12:17172 (R;SU;In Russian)

QUANTUM GRAVITY
Gravitational Waves
Propagator of quantum gravity in minisuperspace, 12:17387 (R;DK)

QUANTUM MECHANICS
Algebra
Higher hypercomplex numbers and quantum mechanics, 12:17373 (R;SU)
Bethe-Salpeter Equation
Connection of two-particle relativistic quantum mechanics with the Bethe-Salpeter equation, 12:17142 (R;FR)
Fermions
Fock representation for quaternion fields, 12:17173 (R;SU;In Russian)

QUARK MATERIAL
See QUARK MATTER

QUARK MATTER
Heavy ion collisions, the quark-gluon plasma and antinucleon annihilation, 12:17125 (R;IN)
Astrophysics
Aborigines of the nuclear desert, 12:16952 (RA;CS)
Correlation Functions
Statistical methods of the description of quark degrees of freedom, 12:17294 (R;SU;In Russian)

QUARK MODEL
See also FLAVOR MODEL
STRING MODELS
Nucleon-Nucleon Interactions
Nucleon-nucleon scattering in a nonrelativistic quark model, 12:17133 (R;DE;In German)
Scalar Fields
Model of nonrelativistic quarks in self-consistent field, 12:17130 (R;SU;In Russian)

QUARK PLASMA
See QUARK MATTER

QUARK SEA
See QUARK MATTER

QUARK-ANTIQUARK INTERACTIONS
Cross Sections
Gluon bremsstrahlung in supersymmetric QCD, 12:17148 (R;SU;In Russian)

QUARK-GLUON PLASMA
See QUARK MATTER

QUARKONIUM
A hypothetical bound state of quark and antiquark.
Quarkonia, 12:17111 (RA;CS)
Hadronic Particle Decay
On the question of Higgs boson production in heavy quarkonium decays, 12:17129 (R;SU)
Radiative Decay
On the question of Higgs boson production in heavy quarkonium decays, 12:17129 (R;SU)

QUARK-QUARK INTERACTIONS
Cross Sections
Gluon bremsstrahlung in supersymmetric QCD, 12:17148 (R;SU;In Russian)

QUARKS
Pair Production
Gluon bremsstrahlung in supersymmetric QCD, 12:17148 (R;SU;In Russian)
Particle Production
Heavy flavors, 12:17155 (R;US)
Structure Functions
QCD and hard quark and gluon scattering, 12:17138 (RA;CS)
Vacuum States
Approach to calculation of the infrared region contribution to vacuum expectation values of gluonic and quark fields, 12:17163 (R;SU)

QUASARS
Emission Spectra
Continuum radiation from active galactic nuclei: a statistical study, 12:17039 (R;US)

QUASIPARTICLE-PHONON MODEL
Quasiparticle-phonon nuclear model, 12:17290 (R;SU)
Deformed Nuclei
Basic equations of the quasiparticle-phonon nuclear model for deformed even-even nuclei, 12:17296 (R;SU;In Russian)
Even-Even Nuclei
Basic equations of the quasiparticle-phonon nuclear model for deformed even-even nuclei, 12:17296 (R;SU;In Russian)

QUEENSLAND
Underground Mining
Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)

QUERCUS
See OAKS

QUINOLINES
Biological Accumulation
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Root Absorption
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)

R

R CODES
REEPS [Residual End-Use Energy Planning] code: User's guide (Residential End-Use Energy Planning System), 12:16181 (R;US)
RABBITS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
RACKS (FUEL)
See FUEL RACKS
RADIATION ACCIDENTS
Emergency Plans
Role of the Federal Radiological Monitoring and Assessment Center (FRMAC) following a radiological accident, 12:16914 (R;US)
RADIATION BURDEN
See RADIATION DOSES
RADIATION DAMAGE (BIOLOGICAL)
See RADIATION INJURIES
RADIATION DECONTAMINATION
See DECONTAMINATION
RADIATION DETECTION
See also COSMIC RAY DETECTION
GAMMA DETECTION
NEUTRON DETECTION
X-RAY DETECTION
Dead Time
Two-source method for determining radiation counting dead time, 12:16662 (J;US)
RADIATION DETECTORS
See also CHERENKOV COUNTERS
GRAVITATIONAL WAVE DETECTORS
IONIZATION CHAMBERS
NEUTRON DETECTORS
POSITION SENSITIVE DETECTORS
PROPORTIONAL COUNTERS
SCINTILLATION COUNTERS
SHOWER COUNTERS
STREAK CAMERAS
Calibration
Technical guidelines for radiological calibrations, 12:16874 (RA;US)
Using a cyclotron plus ECR source for detector evaluation and calibration, 12:16650 (J;NL)
Computerized Simulation
Report of the working group on detector simulation, 12:16594 (R;US)
RADIATION DOSEMETERS
See DOSEMETERS
RADIATION DOSES
S Codes
SKYSHIN: A computer code for calculating radiation dose over a barrier, 12:17330 (R;US)
RADIATION EXPOSURE (DOSES)
See RADIATION DOSES
RADIATION HEATING
S Codes
SHARDA - a program for sample heat, activity, reactivity and dose analysis, 12:17304 (R;IN)
RADIATION HYGIENE
See RADIATION PROTECTION
RADIATION INJURIES
Biological Repair
Sublethal damage is not the same as potentially lethal damage, 12:16867 (RA;US)
RADIATION MONITORS
See also NEUTRON MONITORS
Alpha Detection
High-sensitive and quantitative in-line monitoring method for transplutonium elements separation processes, 12:15382 (R;CN;In Chinese)
Design
Evaluation of use of the NNC Gamma-12 portal monitor for internal dosimetry screening during decommissioning, 12:16012 (RA;US)
Performance
Evaluation of use of the NNC Gamma-12 portal monitor for internal dosimetry screening during decommissioning, 12:16012 (RA;US)
RADIATION PROTECTION
M Codes
MICROSHIELD - a microcomputer program for analyzing dose rate and gamma shielding, 12:16114 (J;US)
Optimization
Two example applications of optimization techniques to radiation protection programmes of United States Department of Energy Contractors, 12:17333 (BA;XA)
P Codes
PROCESS - a source term calculation program for the PC, 12:16113 (J;US)
Personnel
Training requirements for health physicists in the decontamination/decommissioning field, 12:15536 (RA;US)
Remote Handling Equipment
Training program requirements for remote equipment operators in nuclear facilities, 12:16454 (J;US)
Research Programs
Health physics support and assistance to the Department of Energy, 12:16873 (RA;US)
RADIATION SAFETY
See RADIATION PROTECTION
RADIATION SOURCES
For cosmic sources of radiation see also COSMIC GAMMA SOURCES, COSMIC RADIO SOURCES, and COSMIC X-RAY SOURCES.
See also GAMMA SOURCES
SYNCHROTRON RADIATION SOURCES
Calibration
Calibration of high-dose radiation facilities (Handbook), 12:17329 (R;IN)
Regulations
FDA (Food and Drug Administration) compliance program guidance manual (FY 87). Section 4. Medical and radiological devices, 12:16911 (R;US)
RADIATION TRANSPORT
See also CHARGED-PARTICLE TRANSPORT
NEUTRAL-PARTICLE TRANSPORT
G Codes
Conversion of radionuclide transport codes to IBM-compatible microcomputers, 12:17328 (J;US)
L Codes
Conversion of radionuclide transport codes to IBM-compatible microcomputers, 12:17328 (J;US)
RADICIDATION
Cost Benefit Analysis
Proposal for imported fish meal radicidation, 12:16852 (RA;CS;In Czech)
RADIOACTIVATION
Data Covariances
Covariances for measured activation and fission ratios data, 12:17256 (R;US)
RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES
RADIOACTIVE GASEOUS WASTES
See RADIOACTIVE WASTES
RADIOACTIVE MATERIALS
See also FISSION PRODUCTS
RADIOACTIVE WASTES
Storage
Automated nuclear storage facility, 12:15404 (J;US)
RADIOACTIVE TRACERS
See RADIOPHARMACEUTICALS
RADIOACTIVE WASTE DISPOSAL
Final resting place of a cesium 137 gauge, 12:15559 (RA;US)
Comparative Evaluations
Economics of disposal at future disposal facilities, 12:15460 (J;US)
Cost Benefit Analysis
Cost effectiveness of below-threshold waste disposal at DOE sites, 12:15465 (J;US)

Economics
Cost effectiveness for improved methods of low-level radioactive waste disposal, 12:15463 (J;US)
Economics of disposal at future disposal facilities, 12:15460 (J;US)
Effect of technology on the economics of low-level waste disposal, 12:15461 (J;US)
Modeling the economics of LLW volume reduction, 12:15462 (J;US)
Geology
Hydrogeological basis for the modelling area Oberbauenstock, 12:15434 (R;CH;In German)
Leaching
Waste glass leaching: Chemistry and kinetics, 12:15448 (R;US)
Marine Disposal
Pore-water pressure events during the in situ heat transfer experiment simulation: Piezometer probe technology, 12:15450 (R;US)
Rock Drilling
Exploratory borehole Boettstein: Construction and environmental aspects, drilling techniques, 12:15431 (R;CH;In German)
Site Preparation
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Site Selection
Site clean-up requirements: where does one dispose of dirt?, 12:15537 (RA;US)
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project, 12:15421 (R;US)
Systems Analysis
Optimized application of systems engineering to nuclear waste repository projects, 12:15471 (J;US)
Underground Disposal
Exploratory borehole Boettstein: Investigation report. Text volume, 12:15430 (R;CH;In German)
Exploratory borehole Boettstein: Construction and environmental aspects, drilling techniques, 12:15431 (R;CH;In German)
Hydrogeological basis for the modelling area Oberbauenstock, 12:15434 (R;CH;In German)
Long-term stability of bentonite under repository conditions, 12:15433 (R;CH;In German)
Shrinkage experiments on bentonite samples, 12:15432 (R;CH;In German)
Some considerations concerning the thermodynamics and kinetics of the reaction between iron and water in bentonite, 12:16406 (R;CH;In German)

RADIOACTIVE WASTE FACILITIES
See also WIPP
Contamination Regulations
Development of residual radioactivity criteria, 12:15490 (RA;US)
Decommissioning
Decontamination/decommissioning of mixed hazardous and radioactive waste disposal sites, 12:15538 (RA;US)
Health physics experience in the decontamination and decommissioning of the 203-S, 204-S, and 205-S uranium nitrate hexahydrate purification and waste tank car unloading facilities, 12:15533 (RA;US)
Decontamination
Decontamination/decommissioning of mixed hazardous and radioactive waste disposal sites, 12:15538 (RA;US)
Health physics experience in the decontamination and decommissioning of the 203-S, 204-S, and 205-S uranium nitrate hexahydrate purification and waste tank car unloading facilities, 12:15533 (RA;US)
Industrial safety and health physics interactions during slurry transfer of 1000 curies of radium residues at the Niagara Falls Storage Site (NFSS), 12:15499 (RA;US)
License Applications
Standard format and content of a license application for a low-level radioactive waste disposal facility: Safety analysis report, 12:15435 (R;US)
Standard review plan for the review of a license application for a low-level radioactive waste disposal facility: Safety analysis report, 12:15436 (R;US)
Materials Testing
Materials aspects of nuclear waste isolation, 12:15486 (BA;US)
Performance
Effect of percolation rate on water-travel time in deep, partially saturated zones, 12:15438 (RA;US)
Fluid flow in a fractured rock mass, 12:15437 (RA;US)
Radiation Protection
Health physics and operational experience gained from slurry transfer of wastes containing 780 curies of radium-226, 12:15556 (RA;US)
Site Selection
Crystalline Repository Project: Review and comment of the Leech Lake Reservation Business Committee: Draft area recommendation report, 12:15420 (R;US)
Draft area recommendation report for the Crystalline Repository Project: Comments: Final technical report, 12:15419 (R;US)
Waste Management
Laboratory protocol for co-contaminated waste, 12:15539 (RA;US)

RADIOACTIVE WASTE MANAGEMENT
Classification
Approach to defining de minimis, intermediate, and other classes of radioactive waste, 12:15459 (J;US)
Grants
Historically Black Colleges and Universities Radioactive Waste Management Research Program: Summary of activities, 1985-1986, 12:15424 (R;US)
Records Management
Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
Research Programs
Historically Black Colleges and Universities Radioactive Waste Management Research Program: Summary of activities, 1985-1986, 12:15424 (R;US)
Nuclear engineering, health physics, and radioactive waste management fellowship program: Summary of program activities: Radioactive waste management fellowship, 1985-1986, 12:15423 (R;US)
Risk Assessment
Hazard waste risk assessment, 12:15444 (RA;US)

RADIOACTIVE WASTE PROCESSING
Ceramic Melters
Off-gas chemistry study of melter feed by Springborn Laboratories, 12:15425 (R;US)
Containers
Alternative low-level waste processing techniques, 12:15467 (J;US)
Flocculation
Processing of miscellaneous radioactive effluents by continuous flocculation decantation, 12:15426 (R;FR;In French)
Hot Cells
Remote lighting systems for the defense waste processing facility, 12:15481 (J;US)
Quality Assurance
Quality assurance consideration for cement-based grout technology programs at Oak Ridge National Laboratory, 12:15414 (R;US)
Remote Handling Equipment
Canister grapple for the defense waste processing facility, 12:15482 (J;US)
Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
Demonstration of a remotely operated TRU waste size-reduction and material handling process, 12:15484 (J;US)
Equipment experience in a radioactive LFCM vitrification facility, 12:15478 (J;US)
Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant, 12:15477 (J;US)
Stainless steel decontamination manipulators, 12:15479 (J;US)
Remote Viewing Equipment
Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)

Remote viewing of melter interior: defense waste processing facility, 12:15483 (J;US)
Safety
Council of State decision relating to examinations under Section 5 of the Radiation Protection Act (No. 243/58), 12:15573 (R;FI;In Finnish)
Solidification
Alternative low-level waste processing techniques, 12:15467 (J;US)
Prediction of critical grout parameters: critical flow rate, 12:15469 (J;US)
Vitrification
Canister grapple for the defense waste processing facility, 12:15482 (J;US)
Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
Equipment experience in a radioactive LFCM vitrification facility, 12:15478 (J;US)
Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant, 12:15477 (J;US)
Remote viewing of melter interior: defense waste processing facility, 12:15483 (J;US)
Volume
Demonstration of a remotely operated TRU waste size-reduction and material handling process, 12:15484 (J;US)
Evaluation of glovebox sectioning using weld splitting techniques, 12:16458 (J;US)

RADIOACTIVE WASTE STORAGE
See also MONITORED RETRIEVABLE STORAGE
Containers
Cumulative releases of radionuclides from uncontained waste packages, 12:15475 (J;US)
Radionuclide transport through penetrations in nuclear waste containers, 12:15474 (J;US)
Radionuclide Migration
Cumulative releases of radionuclides from uncontained waste packages, 12:15475 (J;US)
Radionuclide transport through penetrations in nuclear waste containers, 12:15474 (J;US)
Underground Storage
Cumulative releases of radionuclides from uncontained waste packages, 12:15475 (J;US)
Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant, 12:15472 (J;US)

RADIOACTIVE WASTES
See also ALPHA-BEARING WASTES
HIGH-LEVEL RADIOACTIVE WASTES
INTERMEDIATE-LEVEL RADIOACTIVE WASTES
LOW-LEVEL RADIOACTIVE WASTES
Contamination Regulations
Residual surface contamination limits: problems in interpretation and implementation, 12:15495 (RA;US)
Dose Limits
National and international considerations of a de minimis dose, 12:15491 (RA;US)
Qualitative Chemical Analysis
Radioactive waste assay at the West Valley Demonstration Project, 12:15529 (RA;US)
Radiation Monitoring
Final resting place of a cesium 137 gauge, 12:15559 (RA;US)

RADIOAPPLICATORS
See RADIATION SOURCES

RADIOCHEMISTRY
Measuring Instruments
Analytical instruments at the Institute of Radiochemistry, 12:16430 (R;DE;In German)

RADIODIAGNOSIS (RADIONUCLIDES)
See NUCLEAR MEDICINE

RADIOFREQUENCY SYSTEMS
See RF SYSTEMS

RADIOISOTOPE BATTERIES
Impact Tests
General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)
Safety
General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)

RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION

RADIOISOTOPE-LABELLED DRUGS
See RADIOPHARMACEUTICALS

RADIOISOTOPES
Spontaneous Fission
Half-lives and kinetic energies for the spontaneously emitted heavy ions from nuclei, 12:17292 (R;SU)
Uptake
A calibration phantom for absolute quantitation of radionuclide uptake by SPECT, 12:16819 (J;US)

RADIOLOGICAL PERSONNEL
Working Conditions
Decree relating to the annual leave of persons working under harmful radiation conditions (No. 175/67), 12:15572 (R;FI;In Finnish)

RADIOLOGICAL PROTECTION
See RADIATION PROTECTION

RADIOLOGY
For the use of radiant energy in medicine.
Management
Selection of patients for x-ray examinations: skull x-ray examination for trauma, 12:16814 (R;US)

RADIONUCLIDE MIGRATION
In environment.
Mathematical Models
Effect of percolation rate on water-travel time in deep, partially saturated zones, 12:15438 (RA;US)
Fluid flow in a fractured rock mass, 12:15437 (RA;US)

RADIONUCLIDE TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION

RADIONUCLIDES
See RADIOISOTOPES

RADIOPASTEURIZATION
See RADICIDATION

RADIOPHARMACEUTICALS
Chemical Preparation
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
Historical Aspects
Medical isotopes at Oak Ridge National Laboratory, 12:16811 (R;US)
Injection
Radiopharmaceutical delivery system for controlled arterial concentration in physiologic modeling with computed tomography, 12:16822 (J;US)
Purification
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
Quality Assurance
Joint CDRH (Center for Devices and Radiological Health) and state quality-assurance surveys in nuclear medicine: Phase 2 - radiopharmaceuticals, 12:16861 (R;US)
Tissue Distribution
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)

RADIOWAVE RADIATION
See also SOLAR RADIO BURSTS
Non-Equilibrium Plasma
Radiation from turbulent plasmas, 12:17404 (RA;CS)

RADIUM 224
Tissue Distribution
Age dependent retention of ^{212}Pb in the skeleton following ^{224}Ra uptake, 12:16857 (R;US)

RADIUM 226
Biological Half-Life
Long-term loss of radium in 63 subjects first exposed at ages 6 to 46, 12:16855 (R;US)

Body Burden
Radium uptake in utero, 12:16856 (R;US)
Isotope Ratio
Gas exchange measurements in natural systems, 12:16789 (BA;US)
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Radium uptake in utero, 12:16856 (R;US)

RADIUM 227
Geochemistry
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)

RADIUM D
See LEAD 210

RADIUM F
See POLONIUM 210

RADON 222
Isotope Ratio
Gas exchange measurements in natural systems, 12:16789 (BA;US)

RAILWAYS
Environmental Impacts
Rail transportation corridor analysis report: Deaf Smith County location in the Palo Duro Basin, Texas, 12:15487 (R;US)

RAMAN SPECTROSCOPY
Prior to March 1983 this concept was indexed to RAMAN SPECTRA.
Uses
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

RANDOM PHASE APPROXIMATION
Random phase approximation, 12:17286 (R;FR)

RANGE FINDERS
Design
Surface contouring with a range finder, 12:16812 (R;US)

RARE EARTH COMPOUNDS
See also CERIUM COMPOUNDS
MONAZITES
YTTERBIUM COMPOUNDS
Energy Transfer
Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)
Optical Properties
Energy transfer and non-linear optical properties at near ultraviolet wavelengths: Rare earth 4f → 5d transitions in crystals and glasses: Progress report for the period June 1, 1986 to May 31, 1987, 12:16353 (R;US)

RARE GASES
See also ARGON
HELIUM
KRYPTON
NEON
XENON
Adsorption
Heat capacities of rare gases adsorbed on graphite. Technical report, 12:16345 (R;US)
Atom-Atom Collisions
Asymmetric scattering in thermal collisions of alkali (/sup 2/P/sub 3/2/)-atoms with rare gas atoms: Na(3/sup 2/P/sub 3/2/) and K(4/sup 2/P/sub 3/2/) with Ne, Ar and Kr, 12:17079 (RA;CS)
Nonlinear Optics
Physical processes at high field strengths, 12:17066 (R;US)
Specific Heat
Heat capacities of rare gases adsorbed on graphite. Technical report, 12:16345 (R;US)

RATS
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50s} and a compilation of experimental data, 12:16859 (R;US)

RAW MATERIALS
Testing
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)

RDF
See REFUSE DERIVED FUELS

REACTION INTERMEDIATES
Alkylation
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)

REACTION KINETICS
See also NUCLEAR REACTION KINETICS
Application of hot spot conception to analysis of spectra from reactions with light bombarding nuclei, 12:17225 (R;SU;In Russian)

REACTION MECHANISMS
See REACTION KINETICS

REACTION RATE
See REACTION KINETICS

REACTIVITY
S Codes
SHARDA - a program for sample heat, activity, reactivity and dose analysis, 12:17304 (R;IN)

REACTOR ACCIDENTS
See also ATWS
DESIGN BASIS ACCIDENTS
LOSS OF COOLANT
REACTOR CORE DISRUPTION
Emergency Plans
APTCARE - Lucas Heights. A plan to cope with accidents at the Research Establishment of the Australian Atomic Energy Commission, Lucas Heights, NSW, 12:16037 (R;AU)
Fission Product Release
Experimental determination of the partition coefficient of HOI, 12:16104 (J;US)
MHTGR confinement radiation releases, 12:16108 (J;US)
QUASAR: a methodology for quantification of uncertainties in severe-accident source terms, 12:16102 (J;US)
Quasar uncertainty study, 12:16004 (R;US)
Human Populations
Environmental radioactivity and radiation exposure in southern Bavaria after the Chernobyl accident, 12:16768 (R;DE;In German)
Radiation Doses
Inclusion of the ocean breeze in Oyster Creek emergency off-site dose assessment, 12:16074 (J;US)
Radiation Protection
Reflection of gamma radiation in a spherical concrete-walled room, 12:16115 (J;US)
Radioactivity Transport
Effect of hygroscopicity on aerosol behavior, 12:16103 (J;US)
Effects of organic impurities on the partitioning of iodine, 12:16105 (J;US)
Reactor Core Disruption
Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel, 12:16116 (J;US)
Reactor Dismantling
Design rationale for a remote work vehicle, 12:16128 (J;US)

REACTOR CHANNELS
Passage through the reactor.
Heat Transfer
Diversion cross-flow mixing at the inlet of a simulated rod bundle using a gamma camera, 12:15942 (J;US)
DNB prediction in assemblies with mixing vanes and unheated tubes, 12:15943 (J;US)
Streamlined one-pass modelling, 12:15835 (J;US)
Hydraulics
Diversion cross-flow mixing at the inlet of a simulated rod bundle using a gamma camera, 12:15942 (J;US)
DNB prediction in assemblies with mixing vanes and unheated tubes, 12:15943 (J;US)

Streamlined one-pass modelling, 12:15835 (J;US)

REACTOR COMPONENTS
See also BREEDING BLANKETS
CONTROL ROD DRIVES
FUEL ELEMENTS
REACTOR CHANNELS
REACTOR COOLING SYSTEMS
REACTOR CORES

Aging
Search of excellence: the problems of material aging and reliability in an older nuclear unit at the Southern California Edison company, 12:15828 (J;US)

Decontamination
Decontamination process for hot leg LMFBR components, 12:15852 (RA;US)

Failures
Looking out for common cause failures, 12:15919 (J;US)

In-Service Inspection
Efficiencies of CSP plans in quality control, 12:15954 (BA;US)

Inspection
Reinspection methods implemented for quality, 12:16109 (J;US)

Performance
Characterization of the performance of major LWR components: Final report, 12:15770 (R;US)

Quality Control
Efficiencies of CSP plans in quality control, 12:15954 (BA;US)

Reliability
Search of excellence: the problems of material aging and reliability in an older nuclear unit at the Southern California Edison company, 12:15828 (J;US)

Repair
Welding nuclear plant components, 12:15950 (J;US)

Seismic Effects
Synthesizing seismic fragility of components by use of existing data, 12:16006 (R;US)

Sodium
Complete sodium removal from equipment, 12:15860 (J;US)

Valves
Motor-operated valve operability verification and trending from the motor control center, 12:15952 (J;US)

Wear
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)

Welded Joints
Welding nuclear plant components, 12:15950 (J;US)

REACTOR CONTROL SYSTEMS

Artificial Intelligence
Implicit Kalman filter algorithm for nuclear reactor analysis, 12:15963 (J;US)

REACTOR CONTROL THEORY
See REACTOR KINETICS

REACTOR COOLING SYSTEMS
See also PRIMARY COOLANT CIRCUITS
SECONDARY COOLANT CIRCUITS

Corrosion Products
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)

Damage
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)

Feedwater
Plant experience with temporary reverse osmosis makeup water systems, 12:15824 (J;US)

Fluid Flow
Thermal-hydraulic aspects of flow inversion in a research reactor, 12:15982 (R;US)

Natural Convection
An analytical and experimental investigation of natural circulation transients in a model pressurized water reactor, 12:15805 (R;US)

Pumps
Vibration monitoring/diagnostic techniques, as applied to reactor coolant pumps, 12:15823 (J;US)

Water Chemistry
Properties of colloidal corrosion products and their effects on nuclear plants: Final report, 12:15769 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)

REACTOR CORE DISRUPTION

Computerized Simulation
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

Film Boiling
Effects of water in film boiling over liquid-metal melts, 12:16107 (J;US)

Fission Product Release
Analysis of fission product release during a simulated severe fuel damage accident: The HEVA programme, 12:16034 (R;FR)
Calculations for determining appropriate key radionuclides for failed fuel analysis, 12:15827 (J;US)

H Codes
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

Heat Transfer
Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1, 12:16141 (J;US)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

Hydraulics
Application of a direct-heating model to the Sandia SURTSEY tests, 12:16140 (J;US)
Corium droplet size in direct containment heating, 12:16139 (J;US)
Direct-heating containment vessel interaction code (DHCVIC) and prediction of SNL SURTSEY test DCH-1, 12:16141 (J;US)
Heat radiation through steam in direct containment heating, 12:16142 (J;US)
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

Probability
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
New time-line technique for station blackout core-melt analysis, 12:16122 (J;US)
Summary of core damage frequency from internal initiators: Surry, 12:16081 (J;US)
Summary of core damage frequency from internal initiators: Peach Bottom, 12:16082 (J;US)
Summary of core damage frequency from internal initiators: Sequoyah, 12:16083 (J;US)
Summary of core damage frequency from internal initiators: Grand Gulf, 12:16084 (J;US)

REACTOR CORE RESTRAINTS

Radiation Monitoring
Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel, 12:16116 (J;US)

REACTOR CORES
See also HETEROGENEOUS REACTOR CORES

Computerized Simulation
PC-based flux mapping data collection system, 12:15829 (J;US)

Damage
The relationships and influences of fuel and coolant system processes during LWR severe accidents, 12:16061 (R;US)

Data Acquisition Systems
PC-based flux mapping data collection system, 12:15829 (J;US)

Deformation
Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime, 12:15865 (J;US)

Design
Physics considerations in the design of long-life cores, 12:15862 (J;US)
Safety aspects of LMR [liquid metal-cooled reactor] core design, 12:16015 (R;US)
Transient bowing of core assemblies in advanced liquid metal fast reactors, 12:15846 (R;US)

Heat Transfer
Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime, 12:15865 (J;US)
Countercurrent flow and flooding with abrupt area changes, 12:15793 (J;US)
Dual loop jet pump model for BWR stability analysis, 12:15795 (J;US)
Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach, 12:16003 (J;US)
Prediction of transient axial power distribution for calculation of the DNBR limit, 12:15794 (J;US)
Hydraulics
Bowing of elements and changes in radial coolant temperature profile over subassembly lifetime, 12:15865 (J;US)
Countercurrent flow and flooding with abrupt area changes, 12:15793 (J;US)
Dual loop jet pump model for BWR stability analysis, 12:15795 (J;US)
Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach, 12:16003 (J;US)
Prediction of transient axial power distribution for calculation of the DNBR limit, 12:15794 (J;US)
Neutron Dosimetry
Reactor physics (nuclear power plant design and operation) and in core dosimetry, 12:16620 (RA;CS;In Czech)
Neutron Flux
PC-based flux mapping data collection system, 12:15829 (J;US)
Startup range neutron monitor period-based transient monitor, 12:15788 (J;US)
Neutron Spectra
Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 2, 12:15927 (RA;CS;In Czech)
Neutron Spectroscopy
Spectrometry and in core dosimetry of neutron radiation. Part I. Invited papers, 12:16619 (R;CS;In Czech)
Neutron Transport
Calculations of spatial and energy distribution of neutrons in reactor core and shielding. Part 1, 12:15926 (RA;CS;In Czech)
Planning
Qualification of an LWBR-irradiated fuel assay gauge, 12:15864 (J;US)
Power Distribution
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
ARMP-02 documentation: Part 2, Chapter 7, MICBURN-E computer code manual: Volume 1, Theory and numerics manual, 12:15774 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
Reactivity
Effect of a detailed radial core expansion reactivity feedback model on ATWS calculations using SASSYS/SAS4A, 12:16075 (J;US)
Impacts of reactivity feedback uncertainties on inherent shutdown in innovative designs, 12:16076 (J;US)
Reactor Core Restraints
Transient bowing of core assemblies in advanced liquid metal fast reactors, 12:15846 (R;US)
Service Life
Physics considerations in the design of long-life cores, 12:15862 (J;US)

REACTOR DECOMMISSIONING
Cost Recovery
Nuclear decommissioning - the financial R & R problems, 12:15905 (J;US)
Financing
Utility perspectives on decommissioning - the accounting involvement, 12:16065 (J;US)
Planning
Utility perspectives on decommissioning - the accounting involvement, 12:16065 (J;US)

REACTOR DISMANTLING
Remote Handling Equipment
Design and testing of remote handling systems for reprocessing plant maintenance and for nuclear reactor dismantling, 12:15394 (J;US)
Integrated defueling system for Three Mile Island Unit 2, 12:16127 (J;US)

REACTOR FUEL ELEMENTS
See FUEL ELEMENTS

REACTOR FUELS
See NUCLEAR FUELS

REACTOR INSTRUMENTATION
Service Life
Baseline characterization of electrical circuits to support plant life extension, 12:15821 (J;US)
Testing
Baseline characterization of electrical circuits to support plant life extension, 12:15821 (J;US)

REACTOR KINETICS
A Codes
Method of baffle/reflector region homogenization, 12:15816 (J;US)
Pin Power prediction in the Westinghouse Advanced Nodal Code, 12:15815 (J;US)
Albedo
Method of baffle/reflector region homogenization, 12:15816 (J;US)
Computer Calculations
Different perspectives on the use of personal computers for technical analyses, 12:16449 (J;US)
PC-class microcomputer experience in radiation protection and shielding analysis at INEL, 12:16448 (J;US)
Computerized Simulation
Development and applications of core simulation for the Hanford N Reactor, 12:15841 (J;US)
Feedback simulation of ramped power transients using transfer functions, 12:15931 (J;US)
Flux flattening in a graphite-moderated core, 12:15842 (J;US)
Implicit Kalman filter algorithm for nuclear reactor analysis, 12:15963 (J;US)
Improved numerical method for subchannel cross-flow calculations, 12:15784 (J;US)
Parity simulation for nuclear plant analysis, 12:15928 (J;US)
Perturbation Theory
GPT methods for fuel evolution and shuffling studies, 12:15929 (J;US)
Reactivity Worths
Reactivity worth of gas expansion modules (GEMs) in the fast flux test facility, 12:15861 (J;US)

REACTOR MAINTENANCE
Radiation Protection
Tomorrow's mobile robots in today's nuclear power plants, 12:16131 (J;US)
Remote Handling Equipment
Monitor III, 12:15923 (J;US)
Robotic system for remote maintenance of a pulsed nuclear reactor, 12:16002 (J;US)

REACTOR MATERIALS
To be assigned in conjunction with the specific descriptor for the material used in a reactor, provided this descriptor is not yet up-posted to reactor materials.
See also NUCLEAR FUELS
Aging
Aging degradation of cast stainless steel, 12:15765 (R;US)

REACTOR NOISE
Computerized Simulation
Digital generation of stochastic signals of arbitrary spectral shape, 12:15925 (R;CH)

REACTOR OPERATION
Computerized Simulation
U-tube steam generator model for the DSNP language, 12:15831 (J;US)
Perturbation Theory
System reliability analysis via generalized perturbation theory methods, 12:15930 (J;US)

Systems Analysis
System reliability analysis via generalized perturbation theory methods, 12:15930 (J;US)
REACTOR OPERATORS
Training
Application of embedded training in nuclear power plant control rooms, 12:16071 (J;US)
REACTOR PHYSICS
Use only for indexing articles of very broad coverage, such as annual reviews, text book, etc.
A Codes
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 2, User's manual, 12:15777 (R;US)
ARMP-02 documentation: Part 2, Chapter 12, NORGE-B2 computer code manual: Volume 3, Programmer's manual, 12:15775 (R;US)
REACTOR SAFETY
Human Factors
Human approach to process control and the provision of predictive information, 12:16069 (J;US)
Reinspection methods implemented for quality, 12:16109 (J;US)
Stimulator-based model for estimating operator diagnosis failure probabilities, 12:16101 (J;US)
REACTOR SITES
Geophysical Surveys
Present status of geological and geophysical work at selected nuclear power plant sites in Czechoslovakia, 12:15966 (RA;CS;In Czech)
Seismic Surveys
Dynamic parameters of seismic waves and the seismic threat to a nuclear power plant site, 12:16039 (RA;CS;In Czech)
Present state and prospects of calculation techniques of seismic engineering at Energoprojekt Praha, 12:15968 (RA;CS;In Czech)
Synthetic seismic shifts and prospects of application, 12:15967 (RA;CS;In Slovak)
REACTOR SITING
See SITE SELECTION
REAGENTS
See also RHODAMINES
Regeneration
Bench scale development of the TRW process for cleaning coal (gravimelt process): Quarterly technical progress report for the period February 1985-April 1985, 12:15282 (R;US)
RECOMBINANT DNA
Molecular Structure
T-DNA and opine synthetic loci in tumors incited by Agrobacterium tumefaciens A281 on soybean and alfalfa plants, 12:16804 (J;US)
RECOVERY (TRITIUM)
See TRITIUM RECOVERY
RECYCLE (FUEL)
See FUEL CYCLE
RECYCLING (FUEL)
See REPROCESSING
REFERENCE MAN
Calibration Standards
Task group on Reference Man to revise ICRP Publication 23, 12:17334 (J;US)
REFRACTORY METALS
Diffusion
Atomic-defect mechanisms for diffusion in refractory bcc metals, 12:16248 (R;US)
REFRIGERATORS
Energy Storage Systems
Cryogenic regenerators, 12:16438 (R;IN)
REFUELING WATER SYSTEMS
See AUXILIARY WATER SYSTEMS
REFUSE
See SOLID WASTES
REFUSE DERIVED FUELS
Combustion Products
Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)
Production
Study of the feasibility of the commercial production of refuse derived fuel, 12:15595 (R;US)
REFUSE-FUELED POWER PLANTS
Appropriate Technology
Technical requirements on refuse-fuelled heat- and-power plants, 12:15669 (RA;DE;In German)
REGION I
See FEDERAL REGION I
RELATIVITY THEORY
Anisotropy
On permissible space anisotropy, 12:17379 (R;SU;In Russian)
Fluid Mechanics
Radiation gasodynamics equations in the tetrad form for astrophysical applications, 12:17368 (R;SU;In Russian)
Space-Time
On permissible space anisotropy, 12:17379 (R;SU;In Russian)
RELEASE (FISSION PRODUCT)
See FISSION PRODUCT RELEASE
RELIEF VALVES
R Codes
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Reliability
Summary of safety relief valve position indication systems, 12:16119 (J;US)
REMEDIAL ACTION
Education
Public information experience in the uranium mill tailings remedial action (UMTRA) project, 12:15510 (RA;US)
Environmental Impact Statements
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 2, Appendices, 12:15562 (R;US)
Final environmental impact statement: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado: Volume 1, Text, 12:15561 (R;US)
Information Retrieval
Assurance Program for Remedial Action (APRA) microcomputer-operated bibliography management system, 12:15557 (RA;US)
Public Opinion
Public information experience in the uranium mill tailings remedial action (UMTRA) project, 12:15510 (RA;US)
Quality Assurance
Technical assistance to Department of Energy/Office of Operational Safety Assurance Program for remedial action, 12:15442 (RA;US)
Radiation Monitoring
Comparisons of passive environmental radon monitors (PERMs) and track etch (R) radon detectors during remedial actions at the Niagara Falls Storage Site, 12:15513 (RA;US)
Radioactive Waste Disposal
Site clean-up requirements: where does one dispose of dirt?, 12:15537 (RA;US)
Research Programs
Technical assistance to Department of Energy/Office of Operational Safety Assurance Program for remedial action, 12:15442 (RA;US)
REMOTE HANDLING EQUIPMENT
See also MANIPULATORS
Computer-Aided Design
Use of CADD/CAE for remote vehicle system mission planning, 12:16455 (J;US)
Operation
Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)
Performance
Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
Equipment experience in a radioactive LFCM vitrification facility, 12:15478 (J;US)
Performance Testing
Canister grapple for the defense waste processing facility, 12:15482 (J;US)

Demonstration of a remotely operated TRU waste size-reduction and material handling process, 12:15484 (J;US)
Research Programs
Future of remote handling, 12:16451 (J;US)
Robots
Design rationale for a remote work vehicle, 12:16128 (J;US)
Testing
Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)
Training
Training program requirements for remote equipment operators in nuclear facilities, 12:16454 (J;US)
Vehicles
Remote handling of canisters containing nuclear waste in glass at the Savannah River Plant, 12:15477 (J;US)

REMOTE VIEWING EQUIPMENT
Design
Remote viewing of melter interior: defense waste processing facility, 12:15483 (J;US)
Lighting Systems
Remote lighting systems for the defense waste processing facility, 12:15481 (J;US)
Performance
Closed-circuit television and remote crane control for vitrification facilities, 12:15480 (J;US)
High-definition television evaluation for remote handling task performance, 12:16452 (J;US)
Research Programs
Future of remote handling, 12:16451 (J;US)

RENEWABLE ENERGY SOURCES
See also BIOMASS
SOLAR ENERGY
WAVE POWER
WIND POWER
Economics
Renewable energy sources and their uses - application, potentials, economic aspects, 12:16183 (RA;DE;In German)

REPAIR (BIOLOGICAL)
See BIOLOGICAL REPAIR

REPROCESSING
See also PUREX PROCESS
Test Facilities
The integral fast reactor fuels reprocessing laboratory at Argonne National Laboratory, Illinois, 12:15384 (R;US)

REPUBLIC OF CHINA
See TAIWAN

REPUBLIC OF KOREA
Research Reactors
Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach, 12:16003 (J;US)

RESEARCH AND TEST REACTORS
See also EXPERIMENTAL REACTORS
RESEARCH REACTORS
TRAINING REACTORS
TRIGA TYPE REACTORS
Reactor Cooling Systems
Thermal-hydraulic aspects of flow inversion in a research reactor, 12:15982 (R;US)

RESEARCH PROGRAMS
To be used jointly with descriptor(s) for subject field and/or organization concerned.
Computerized Simulation
The SIMRAND I computer program: Simulation of research and development projects, 12:17647 (R;US)
Financing
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Planning
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Program Management
A stochastic approach to project planning in an R and D environment: Final report, 12:17633 (R;US)

RESEARCH REACTORS
See also FFTF REACTOR
IBR-2 REACTOR
LFR REACTOR
SLOWPOKE TYPE REACTORS
SPR-3 REACTOR
Reactor Cores
Evaluation of the thermal safety margin for the KMRR using the hot-spot-factor approach, 12:16003 (J;US)
Reactor Decommissioning
Research reactor and fuel development/production facility decommissioning technology and experience, 12:16067 (J;US)
Reactor Technology
Technology and use of low power research reactors. Report of a consultants' meeting held in Beijing, China, 30 April-3 May 1985, 12:15985 (R;XA)
Uses
Technology and use of low power research reactors. Report of a consultants' meeting held in Beijing, China, 30 April-3 May 1985, 12:15985 (R;XA)

RESERVOIR ROCK
Computerized Simulation
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)
Density
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
Gamma-Gamma Logging
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
Gravimetry
Calculation of gravimetric density caused by three-dimensional structure, 12:15348 (BA;US)
Resistivity Logging
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)
Rock-Fluid Interactions
Viscoelastic behavior of hydrolyzed polyacrylamide solutions in porous media: Some preliminary observations, 12:15358 (BA;US)

RESID
See PETROLEUM RESIDUES

RESIDENTIAL BUILDINGS
See also APARTMENT BUILDINGS
Radiation Monitoring
Measurement of radon and radon progeny in radium contaminated residential properties in New Jersey, 12:15527 (RA;US)
Radioactivity
Measurement of radon and radon progeny in radium contaminated residential properties in New Jersey, 12:15527 (RA;US)
Remedial Action
Experience gained during remedial action at residential properties contaminated with Th-232 and Ra-226, 12:15547 (RA;US)
Remedial action of radium contaminated residential properties, 12:15546 (RA;US)
Space Heating
Heating systems, 12:16202 (RA;DE;In German)

RESIDENTIAL SECTOR
Energy Conservation
Consumer energy conservation policies and programmes in Britain, 12:16166 (R;DE)
Energy Demand
REEPS [Residual End-Use Energy Planning] code: User's guide (Residential End-Use Energy Planning System), 12:16181 (R;US)
Fuel Consumption
Multistate EIA-857 respondent report 1984: Final report, 12:15366 (R;US)

RESIDUAL OILS
See PETROLEUM RESIDUES

RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES

RESISTIVITY LOGGING
Well Logging Equipment
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)

RESONANCE NEUTRONS
Chemical Shift
Chemical shifts of uranium neutron resonances, 12:17251 (RA;CS)
Temperature Dependence
Temperature shift of neutron resonances, 12:17230 (RA;CS)
RESONATING-GROUP METHOD
Hamiltonians
Generating matrix elements of the Hamiltonian of the algebraic version of resonating group method on intrinsic wave functions with various oscillator lengths, 12:17372 (R;SU)
Matrix Elements
Generating matrix elements of the Hamiltonian of the algebraic version of resonating group method on intrinsic wave functions with various oscillator lengths, 12:17372 (R;SU)
RESPIRABLE DUSTS
See DUSTS
RESPIRATORS
Leak Testing
Filter penetration measurements using the condensation nuclei counter and the aerosol photometer, 12:16916 (R;US)
Performance Testing
Powered air-purifying respirator study: Final report, 12:16915 (R;US)
RESPIRATORY EQUIPMENT
See RESPIRATORS
RESPIRATORY SYSTEM
See also LUNGS
Neoplasms
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)
Model compounds and complex mixtures in the open-ended rat tracheal implant model: effects and metabolism, 12:16895 (RA;US)
Pathological Changes
Lifetime studies with mice after exposure to a high-boiling complex organic mixture, 12:15339 (RA;US)
RESPIRATORY SYSTEM DISEASES
Pathogenesis
Responses of the respiratory tract to inhaled particle-organic mixtures, 12:16893 (RA;US)
RETORTED SHALES
See SPENT SHALES
RETORTING
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Waste Water
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
REVERSE-FIELD PINCH
Design
Design considerations for a large anti s FRC facility, 12:17464 (RA;US)
Fusion reactor options and alternatives for the RFP, 12:17503 (J;US)
Electric Conductivity
Plasma resistivity near null magnetic field region in FRC, 12:17476 (RA;US)
Electric Currents
Current drive by helicity injection in RFP's and spheromaks, 12:17459 (RA;US)
Energy Losses
Energy confinement in a high-current reversed field pinch, 12:17483 (RA;US)
Ion Plasma Waves
Energy confinement in a high-current reversed field pinch, 12:17483 (RA;US)
Magnetic Field Configurations
Current drive by helicity injection in RFP's and spheromaks, 12:17459 (RA;US)
Flux trapping during field reversal in the formation of a field reversed configuration, 12:17465 (RA;US)
Generalized helicity and its time derivative, 12:17451 (RA;US)
Preliminary experimental results with the coaxial slow source, 12:17466 (RA;US)
Quasistatic modelling of the coaxial slow source, 12:17467 (RA;US)
Magnetic Flux
Plasma resistivity near null magnetic field region in FRC, 12:17476 (RA;US)
Particle Kinematics
FRC translation into a compression coil, 12:17472 (RA;US)
Plasma Confinement
Energy confinement in a high-current reversed field pinch, 12:17483 (RA;US)
Transport simulation of a field-reversed configuration plasma, 12:17477 (RA;US)
Plasma Guns
Preliminary experimental results with the coaxial slow source, 12:17466 (RA;US)
Quasistatic modelling of the coaxial slow source, 12:17467 (RA;US)
Plasma Heating
Flux trapping during field reversal in the formation of a field reversed configuration, 12:17465 (RA;US)
FRC translation into a compression coil, 12:17472 (RA;US)
Plasma Instability
Recent results of an internal tilt mode calculation in FRCs, 12:17475 (RA;US)
RF SYSTEMS
Constraints
Factors limiting the operation of structures under high gradient, 12:16528 (R;US)
Phase Studies
RF-phase measurement and optimization for the Variable Energy Cyclotron, Calcutta, 12:16520 (R;IN)
RHENIUM ALLOYS
Energy Spectra
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Reflectivity
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
RHESUS MONKEYS
See MACACUS
RHODAMINES
Absorption Spectra
Bibliographic study of photophysical and photochemical properties of laser dyes, 12:16465 (R;FR;In French)
Fluorescence
Bibliographic study of photophysical and photochemical properties of laser dyes, 12:16465 (R;FR;In French)
RICHLAND FFTF REACTOR
See FFTF REACTOR
RICHLAND NPR REACTOR
See N-REACTOR
RIEMANN WAVES
See SHOCK WAVES
RINGOTRON
See ELECTRON-RING ACCELERATORS
RINGS (STORAGE)
See STORAGE RINGS
RISA
See ORGANIC IODINE COMPOUNDS
RISER CRACKING
See COAL LIQUEFACTION
RISK ANALYSIS
See RISK ASSESSMENT
RISK ASSESSMENT
Human Factors
Benchmark of systematic human action reliability procedure, 12:16068 (J;US)
Human factors in risk assessments of nuclear power plants, 12:16070 (J;US)
Information Dissemination
Confidence in technologies: Interactions between publics and industries, 12:16912 (R;US)
L Codes
LAVA [Los Alamos Vulnerability and Risk Assessment Methodology]: A conceptual framework for automated risk analysis, 12:15565 (R;US)

Probability
Continuous Bayesian updating; Normal and two stage, 12:16095 (J;US)
Method to integrate PRA results with plant upgrades, 12:16110 (J;US)
Probabilistic analysis of allowed outage times relaxation at a PWR plant, 12:16099 (J;US)
Quantile arithmetic methodology for uncertainty propagation in fault trees, 12:16111 (J;US)
Public Opinion
Confidence in technologies: Interactions between publics and industries, 12:16912 (R;US)
Surveys
An experiment in combining estimates of uncertainty, 12:16913 (R;US)
RIVER BEND-1 REACTOR
St. Francisville, Louisiana, USA
Nuclear Materials Management
Nuclear fuels accounting interface: River Bend experience, 12:15778 (J;US)
RIVER BEND-2 REACTOR
St. Francisville, Louisiana, USA
Nuclear Materials Management
Nuclear fuels accounting interface: River Bend experience, 12:15778 (J;US)
ROAD TRANSPORT
Risk Assessment
Validation study of the intertran model for assessing risks of transportation accidents: Road transport of uranium hexafluoride, 12:15489 (R;FR)
ROADWAYS (MINES)
See MINE ROADWAYS
ROBOTS
Computer Graphics
Interactive animated displayed of man-controlled and autonomous robots, 12:16459 (J;US)
Electronic Guidance
3-D world modeling with updating capability based on combinatorial geometry, 12:16440 (R;US)
Performance
Experience with the Surveyor mobile robot in radioactive work environments, 12:16457 (J;US)
Tools for decontamination and decommissioning of nuclear facilities, 12:16456 (J;US)
Uses
Evaluating telerobotics for battlefield support operations, 12:16441 (R;US)
Experience with the Surveyor mobile robot in radioactive work environments, 12:16457 (J;US)
Mobilization of existing robotic and teleoperated mobile vehicles to mitigate the consequences of radiological emergencies; a TMI-2 reality and a Chernobyl scenario, 12:16073 (J;US)
Operational experiences with a remote core-boring device, 12:16130 (J;US)
Robotics development at TMI-2, 12:16129 (J;US)
Tomorrow's mobile robots in today's nuclear power plants, 12:16131 (J;US)
Tools for decontamination and decommissioning of nuclear facilities, 12:16456 (J;US)
ROCK MECHANICS
Bench-Scale Experiments
Preliminary rock mechanics laboratory: Investigation plan, 12:16924 (R;US)
ROCK SALT
See SALT DEPOSITS
RODS (FUEL)
See FUEL RODS
ROTORS
Stress Corrosion
Monitoring of steam turbine environments for detection of stress corrosion cracking, 12:15694 (RA;US)
On-line rotor crack detection monitoring system, 12:15695 (RA;US)
RUBIDIUM
X-Ray Fluorescence Analysis
X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria, 12:16374 (R;IN)
RUBY
Electron Collisions
Defects and color centers induced in corundum and ruby by high energy electrons. 3. Optical properties of corundum irradiated by high energy electrons, 12:17344 (R;SU;In Russian)
RUPTURE DISKS
See RELIEF VALVES
RUTHENIUM
Catalytic Effects
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
RUTHENIUM 97
Diagnostic Uses
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
Uptake
Design and evaluation of new ruthenium labeled radiopharmaceuticals for the pancreas and heart, 12:16818 (J;US)
RUTHENIUM COMPLEXES
Catalytic Effects
Improved Fischer-Tropsch synthesis catalysts for indirect coal liquefaction: Final quarterly technical progress report No. 4 for the period 1 July to 30 September 1986, 12:15284 (R;US)
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
RUTHERFORD SCATTERING
Uses
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

S

S CODES
SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
S WAVES (SEISMIC)
See SEISMIC S WAVES
SACCHAROMYCES CEREVISIAE
Pellets
Development and modelling of a gas/solid fluidized-bed fermenter for ethanol production from S. cerevisiae, 12:15590 (R;DE;In German)
SACLAY LINAC
Beam Dynamics
Feedback system analysis for beam breakup in a multipass multisection electron linac, 12:16507 (R;FR)
Feasibility Studies
Feedback system analysis for beam breakup in a multipass multisection electron linac, 12:16507 (R;FR)
Feedback
Feedback system analysis for beam breakup in a multipass multisection electron linac, 12:16507 (R;FR)
SAFE LOW POWER CRITICAL EXPERIMENT
See SLOWPOKE TYPE REACTORS
SAFETY (NUCLEAR)
See RADIATION PROTECTION
SAFETY (REACTOR)
See REACTOR SAFETY

SAFETY VALVES
See RELIEF VALVES
SALINE ZONE
See OIL SHALES
SALT DEPOSITS
Creep
Laboratory investigation of crushed salt consolidation and fracture healing, 12:16925 (R;US)
Excavation
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Geologic Fractures
Laboratory investigation of crushed salt consolidation and fracture healing, 12:16925 (R;US)
Porosity
Laboratory investigation of crushed salt consolidation and fracture healing, 12:16925 (R;US)
Radioactive Waste Disposal
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Rock Mechanics
Preliminary rock mechanics laboratory: Investigation plan, 12:16924 (R;US)
SAMARIUM
Activation Analysis
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
Emission Spectroscopy
Analysis of rare earths and cadmium in reference materials: Li_2SO_4 and $MnSO_4$, 12:16386 (R;FR)
SAMARIUM 154 TARGET
Argon 40 Reactions
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
SAN ONOFRE-1 REACTOR
San Clemente, California, USA
Feedwater
New scenario for intersystem LOCAs in BWRs, 12:16098 (J;US)
Loss of Coolant
New scenario for intersystem LOCAs in BWRs, 12:16098 (J;US)
Reactor Components
Search of excellence: the problems of material aging and reliability in an older nuclear unit at the Southern California Edison company, 12:15828 (J;US)
Reactor Instrumentation
Baseline characterization of electrical circuits to support plant life extension, 12:15821 (J;US)
Reactor Safety
New scenario for intersystem LOCAs in BWRs, 12:16098 (J;US)
SANDIA LABORATORIES
Radioactive Waste Management
Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
Records Management
Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
Waste Transportation
Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
SANDSTONES
Chemical Composition
1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)
Fluid Flow
1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)
Rock-Fluid Interactions
1985/1986 SOMED [School of Mines and Energy Development] project: The effect of temperature, fluid composition, and flow rate on sandstones: implications for enhanced oil recovery methods: Final report, 12:15356 (R;US)
SATELLITE ATMOSPHERES
For atmospheres of the natural satellites.
Spectral Reflectance
Search for volatiles in the surface of icy satellites, 12:16972 (RA;US)
SATELLITES
Infrared Spectra
Planetary spectroscopy, 12:17005 (RA;US)
SATURN PLANET
Brightness
Lunar and planetary studies, 12:16984 (RA;US)
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Carbon Monoxide
Infrared spectroscopy of Jupiter and Saturn, 12:16980 (RA;US)
Deuterium Compounds
Spectroscopic observations of the planets, 12:16986 (RA;US)
Hydrogen
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Extended atmospheres of outer planet satellites and comets. Annual report, 1 August 1985-31 July 1986, 12:17031 (R;US)
Infrared Spectra
Planetary infrared astronomy using a cryogenic postdisperser on Fourier transform spectrometers, 12:16977 (RA;US)
Planetary optical and infrared imaging, 12:17022 (RA;US)
Magnetic Fields
Pioneer 10 and 11 (Jupiter and Saturn) magnetic field experiments. Final report, 12:17032 (R;US)
Methane
Continued program of planetary study at the University of Texas McDonald Observatory, 12:16988 (RA;US)
Outer planet studies, 12:16981 (RA;US)
Microwave Spectra
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Temperature Distribution
Infrared observations of planetary atmospheres, 12:16985 (RA;US)
SAVANNAH RIVER PLANT
Pyrochemical Reprocessing
Interfacing solvent extraction in the recovery of pyrochemical residues at the Savannah River Plant, 12:15387 (R;US)
SCANDIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
SCANDIUM 45
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
SCANDIUM 47
Half-Life
Uncertainties in scientific measurements, 12:17216 (R;US)
SCANDIUM COMPOUNDS
Chemical Preparation
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Chemical Reactions
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene

derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)
Molecular Structure
σ bond metathesis for C-H bonds of hydrocarbons and Sc-R (R = H, alkyl, aryl) bonds of permethylscandocene derivatives. Evidence for noninvolvement of the π system in electrophilic activation of aromatic and vinylic C-H bonds, 12:16414 (J;US)

SCANNING MEASURING PROJECTORS
On-Line Measurement Systems
Dialogue scanning measuring systems, 12:16637 (R;SU;In Russian)

SCATTERING
See also LIGHT SCATTERING
Three-Body Problem
Consideration of the (n,d) and (p,d) scattering and breakup reactions through singular integral equations, 12:17279 (RA;CS)

SCHOOL BUILDINGS
Energy Conservation
ICP [Institutional Conservation Program] monitoring: Final report, 12:16201 (R;US)
Monitoring
ICP [Institutional Conservation Program] monitoring: Final report, 12:16201 (R;US)

SCHROEDINGER EQUATION
Solitons
Approximate two-soliton solution of a generalized Schroedinger equation in nuclear hydrodynamics, 12:17375 (R;SU)

SCIENTIFIC PERSONNEL
Training
Committee on Atomic and Molecular Sciences: Technical progress report for the period February 1, 1986-January 31, 1987, 12:17069 (R;US)

SCINTILLATION CHAMBERS
See SCINTILLATION COUNTERS

SCINTILLATION COUNTERS
See also LIQUID SCINTILLATION DETECTORS
Calibration
Calibration of thermonuclear neutron detectors, 12:17414 (R;SU;In Russian)
Charge-Coupled Devices
CCD[charge-coupled device]-based synchrotron x-ray detector for protein crystallography: Performance projected from an experiment, 12:16600 (R;US)
Helium 3 Target
Advances in the use of ^{3}He in gas scintillation counters, 12:16669 (J;US)

SCINTILLATION DETECTORS
See SCINTILLATION COUNTERS

SCOTLAND
See UNITED KINGDOM

SCRAP METALS
Waste Processing
Cleanup operations at the Oak Ridge Gaseous Diffusion Plant contaminated metal scrapyard, 12:15415 (R;US)

SEA DISPOSAL
See MARINE DISPOSAL

SEALS
Leaks
Monitoring and diagnostic system for reactor coolant pump seals, 12:15947 (RA;US)
Reactor coolant pump seal leakage monitoring, 12:15946 (RA;US)

SEAWATER
PH Value
Carbonate chemistry during WEPOLEX-81, 12:16790 (J;US)

SEBACEOUS GLANDS
See SKIN

SECONDARY BATTERIES
See ELECTRIC BATTERIES

SECONDARY BEAMS
Performance
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)

SECONDARY COOLANT CIRCUITS
Magnetite
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
Water Chemistry
Improved water chemistry controls for minimizing degradation of materials, 12:15811 (J;US)

SECONDARY EMISSION
Thin Films
MeV heavy ion induced desorption from insulating films as function of projectile velocity, 12:17080 (R;FR)

SECONDARY RECOVERY
See ENHANCED RECOVERY

SEDIMENTS
Chemical Composition
Organic storage of CO_2 on the continental slope off the mid-Atlantic bight, the southeastern Bering Sea, and the Peru coast, 12:16786 (J;GB)
Drill Cores
Structure and timing of the last deglaciation: oxygen-isotope evidence, 12:16922 (J;GB)
Environmental Transport
Sediment transport characteristics of the nearshore zone between Hilton Head and Ossabaw Islands, Georgia as determined by heavy mineral analysis, 12:16934 (R;US)

SEFOR REACTOR
Reactor Decommissioning
Gamma analysis of soil at SEFOR, a decommissioned reactor, 12:16000 (J;US)
Soils
Gamma analysis of soil at SEFOR, a decommissioned reactor, 12:16000 (J;US)

SEISMIC EFFECTS
Mathematical Models
Dynamic parameters of seismic waves and the seismic threat to a nuclear power plant site, 12:16039 (RA;CS;In Czech)
Present state of earthquake resistance calculations for the main generating units of nuclear power plants Mochovce and Temelin, 12:16040 (RA;CS;In Czech)
Synthetic seismic shifts and prospects of application, 12:15967 (RA;CS;In Slovak)
Simulation
Physics modelling of reactor V 213-C seismic response, 12:16052 (RA;CS;In Czech)
Soil-Structure Interactions
Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)

SEISMIC P WAVES
Wave Propagation
Experimental studies of elastic-wave propagation in a columnar-jointed rock mass, 12:16926 (J;US)

SEISMIC S WAVES
Wave Propagation
Experimental studies of elastic-wave propagation in a columnar-jointed rock mass, 12:16926 (J;US)

SELENIUM
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)

SEMICONDUCTOR LASERS
Electron Beam Pumping
Electron-pumped high-efficiency semiconductor laser, 12:16462 (R;US)

SEMICONDUCTOR MATERIALS
If possible index also the specific compounds.
Annealing
Amorphous materials and recrystallization, 12:16372 (BA;US)
Crystal Doping
The effects of heavy doping on the electronic states in semiconductors, 12:17340 (R;US)
Energy Levels
Density of states due to pairing of impurities in semiconductor systems, 12:16359 (R;BR)

Heat Transfer
Spatially-resolved non-contact methods for the investigation of transport and defects in semiconductors, 12:16398 (BA;US)
Impurities
Density of states due to pairing of impurities in semiconductor systems, 12:16359 (R;BR)
Ion Implantation
Amorphous materials and recrystallization, 12:16372 (BA;US)
Optical Properties
Spatially-resolved non-contact methods for the investigation of transport and defects in semiconductors, 12:16398 (BA;US)
Photo-Induced Transient Spectroscopy
Spatially-resolved non-contact methods for the investigation of transport and defects in semiconductors, 12:16398 (BA;US)
Recrystallization
Amorphous materials and recrystallization, 12:16372 (BA;US)

SEQUESTRENE
See EDTA

SEQUOYAH NUCLEAR POWER PLANT UNIT-1
See SEQUOYAH-1 REACTOR

SEQUOYAH-1 REACTOR
Daisy, Tennessee, USA
Fuel Management
Low-leakage fuel management in Sequoyah, 12:15806 (J;US)
Reactor Core Disruption
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Summary of core damage frequency from internal initiators: Sequoyah, 12:16083 (J;US)
Risk Assessment
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Summary of core damage frequency from internal initiators: Sequoyah, 12:16083 (J;US)

SERPUKHOV SYNCHROTRON
Beam Production
Relativistic positronium channel at the IHEP accelerator, 12:16555 (R;SU;In Russian)
Neutron Spectra
Low-energy neutron spectra behind the IHEP accelerator shields, 12:16556 (R;SU;In Russian)
Positronium
Relativistic positronium channel at the IHEP accelerator, 12:16555 (R;SU;In Russian)

SERVICE WATER SYSTEMS
See AUXILIARY WATER SYSTEMS

SEWAGE SLUDGE
Biodegradation
Design and construction of a reactor system to model the anaerobic/oxic wastewater treatment system, 12:16835 (RA;US)
Investigations into the mechanisms of interaction between to microbial populations in activated sludge, 12:16837 (RA;US)
Microbial selection in an artificial ecosystem, 12:16838 (RA;US)
Flocculation
Investigations into the mechanisms of interaction between to microbial populations in activated sludge, 12:16837 (RA;US)
Microbial selection in an artificial ecosystem, 12:16838 (RA;US)

SHAFTS
Acoustic Emission Testing
Acoustic emission monitoring of steam turbines: a review of progress, 12:15698 (RA;US)
Cracking
Acoustic emission monitoring of steam turbines: a review of progress, 12:15698 (RA;US)

SHALE OIL
See also SHALE OIL FRACTIONS
Chemical Composition
Assay products from Green River oil shale, 12:15373 (R;US)
Density
Assay products from Green River oil shale, 12:15373 (R;US)

SHALE OIL FRACTIONS
Mutagen Screening
Complex mixtures: comparative chemical and toxicological characterization, 12:15336 (RA;US)

SHEAR WAVES (SEISMIC)
See SEISMIC S WAVES

SHEARON HARRIS-1 REACTOR
See HARRIS-1 REACTOR

SHEATHS (FUEL)
See FUEL CANS

SHEEP
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)

SHELLS
Structural forms; for electron shells in atoms use ELECTRONIC STRUCTURE.
Stability
Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)

SHF RADIATION
See RADIOWAVE RADIATION

SHIELDING
See also MAGNETIC SHIELDING
Buildup
New buildup factor data for point kernel calculations, 12:16450 (J;US)
Computer Calculations
Different perspectives on the use of personal computers for technical analyses, 12:16449 (J;US)
New buildup factor data for point kernel calculations, 12:16450 (J;US)
PC-class microcomputer experience in radiation protection and shielding analysis at INEL, 12:16448 (J;US)
Data Base Management
New buildup factor data for point kernel calculations, 12:16450 (J;US)
Design
Shielding design at Fermilab: Calculations and measurements, 12:16549 (R;US)
M Codes
MICROSHIELD - a microcomputer program for analyzing dose rate and gamma shielding, 12:16114 (J;US)

SHIELDING MATERIALS
Contamination
Radioactive contaminations of materials for low-background setups, 12:16643 (R;SU;In Russian)

SHIELDS
Design
Activation analysis of the Compact Ignition Tokamak, 12:17598 (J;US)
Eddy Currents
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
F Codes
Issues and test requirements in radiation shielding of fusion reactors, 12:17532 (J;US)
Performance Testing
Issues and test requirements in radiation shielding of fusion reactors, 12:17532 (J;US)
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Research Programs
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Torque
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)

SHIPPINGPORT PRESSURIZED WATER REACTOR
See SHIPPINGPORT REACTOR

SHIPPINGPORT REACTOR
Spent Fuel Elements
Qualification of an LWBR-irradiated fuel assay gauge, 12:15864 (J;US)

SHIPS
Design
Structural optimization of large ocean-going structures, 12:16501 (RA;US)

SHOCK ABSORBERS
Plasticity
Survey of existing literature in the field of shock-absorbing materials with a view to subsequent adaptation of plastic deformation codes. Phase 1, 12:16442 (R;FR)
SHOCK WAVES
Acceleration
Shock wave acceleration, 12:16956 (RA;CS)
SHOWER COUNTERS
Detects high energy gamma radiation or high energy particles on basis of cascade showers in layered absorbers.
Energy Absorption
Radial distributions of shower energy deposition in hadron and photon hodoscopic sandwich-type calorimeters with cell structure, 12:16616 (R;SU;In Russian)
Hodoscopes
Radial distributions of shower energy deposition in hadron and photon hodoscopic sandwich-type calorimeters with cell structure, 12:16616 (R;SU;In Russian)
Photon Transport
Monte-Carlo simulation of electromagnetic showers, 12:16603 (R;SU;In Russian)
SHOWERS
See also CASCADE SHOWERS
Computerized Simulation
Monte-Carlo simulation of electromagnetic showers, 12:16603 (R;SU;In Russian)
SI SEMICONDUCTOR DETECTORS
Performance
Performance of a novel silicon detector, 12:16660 (J;NL)
Testing
Detection of charged particles in amorphous silicon layers, 12:16655 (J;NL)
SIALON
See ALUMINIUM OXIDES
SILICON NITRIDES
SID
See SUDDEN IONOSPHERIC DISTURBANCE
SIEMENS UNTERRICHTSREAKTOR
See SUR-100 SERIES REACTOR
SIGMA MODEL
Chiral Symmetry
Dualities in the d=2 asymmetric chiral field sigma models, 12:17171 (R;SU)
Duality
Dualities in the d=2 asymmetric chiral field sigma models, 12:17171 (R;SU)
SILICEOUS ROCK
See SANDSTONES
SILICON
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
Ion Beam Injection
Surface modification of solids, 12:16317 (BA;US)
Ion Implantation
Transient enhanced diffusion and gettering of dopants in ion implanted silicon, 12:16364 (J;US)
Laser Beam Machining
Surface modification of solids, 12:16317 (BA;US)
Melting
Time-resolved ellipsometry and reflectivity measurements of the optical properties of silicon during pulsed excimer laser irradiation, 12:16369 (J;US)
Microelectronics
Assessment of silicon-on-insulator technologies for VLSI (very large scale integration), 12:16486 (R;US)
Physical Radiation Effects
Dose dependence of ion beam mixing of Au on amorphous and single crystalline Si and Ge, 12:16316 (J;US)
Modeling of undercooling, nucleation, and multiple phase front formation in pulsed-laser-melted amorphous silicon, 12:16370 (J;US)
Time resolved studies of rapid solidification in highly undercooled molten silicon, 12:16368 (J;US)
Time-resolved ellipsometry and reflectivity measurements of the optical properties of silicon during pulsed excimer laser irradiation, 12:16369 (J;US)
Transient enhanced diffusion and gettering of dopants in ion implanted silicon, 12:16364 (J;US)
Production
Silicon production in a fluidized bed reactor: Final report, 12:15606 (R;US)
Solidification
Modeling of undercooling, nucleation, and multiple phase front formation in pulsed-laser-melted amorphous silicon, 12:16370 (J;US)
Time resolved studies of rapid solidification in highly undercooled molten silicon, 12:16368 (J;US)
Solubility
Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
Surface Properties
Simulation studies for surfaces and materials strength. Semiannual report, 1 May-31 October 1986, 12:16290 (R;US)
Surface Treatments
Surface modification of solids, 12:16317 (BA;US)
SILICON 28 REACTIONS
Incomplete Fusion Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
SILICON 28 TARGET
Neutron Reactions
Neutron scattering on light even-even nuclei, 12:17214 (RA;CS)
Silicon 28 Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
SILICON 35
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
SILICON 36
Half-Life
Application of the PFIS method to the LISE spectrometer at GANIL: (Experiment beta performed at the GANIL National Laboratory in Caen (France)) beta decay of light neutron rich exotic nuclei, 12:17217 (R;FR)
SILICON ALLOYS
Phase Studies
Phases in U-Si alloys, 12:16256 (R;US)
SILICON CARBIDES
Neutron Fluence
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Physical Radiation Effects
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Voids
NDE reliability and process control for structural ceramics, 12:16333 (R;US)
SILICON COMPOUNDS
See also SILANES, SILOXANES and SILICONES.
See also SILICON CARBIDES
SILICON FLUORIDES
SILICON NITRIDES
SILICON OXIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)

Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)

SILICON FLUORIDES
Auger Electron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation (SF_6, SiF_4), 12:17082 (R;US)
Photoelectron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation (SF_6, SiF_4), 12:17082 (R;US)

SILICON NITRIDES
Crack Propagation
Slow crack growth in sintered silicon nitride, 12:16339 (BA;US)
Voids
NDE reliability and process control for structural ceramics, 12:16333 (R;US)

SILICON OXIDES
Hydration
Hydrogen doping of silica by ion beam enhanced hydration, 12:16349 (R;FR)
Physical Radiation Effects
Hydrogen doping of silica by ion beam enhanced hydration, 12:16349 (R;FR)
Reduction
Fuel savings by controlling SiO/sub 2/ reduction in blast furnaces. Pt. 1. Laboratory research into the mechanism of SiO/sub 2/ reduction. Final report, 12:16239 (R;DE;In German)
Thermodynamic Properties
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)
Voids
NDE reliability and process control for structural ceramics, 12:16333 (R;US)

SILICON SEMICONDUCTOR DETECTORS
See SI SEMICONDUCTOR DETECTORS

SILICON SOLAR CELLS
Electric Contacts
Silicon solar cells with polysilicon contacts, 12:15612 (R;US)

SILOETTE REACTOR
Education
Training on Siloette reactor and associated simulators at the Grenoble Nuclear Research Centre, 12:15993 (RA;XA)
Reactor Simulators
Training on Siloette reactor and associated simulators at the Grenoble Nuclear Research Centre, 12:15993 (RA;XA)

SILVER
Adsorption
Adsorption of Ag on Ge(100)-(2 x 1), 12:16315 (J;GB)
Argon 40 Reactions
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Helium 3 Reactions
Study of cluster emission by excited compound nuclei, 12:17293 (R;SU;In Russian)
Physical Radiation Effects
Radiation enhanced self diffusion in silver, 12:17336 (R;IN)
Self-Diffusion
Radiation enhanced self diffusion in silver, 12:17336 (R;IN)
Surface Properties
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)

SILVER 110
Tracer Techniques
Radiation enhanced self diffusion in silver, 12:17336 (R;IN)

SILVER ISOTOPES
See also SILVER 110
Neon 20 Reactions
Evolution of the fusion like process around the Fermi energy, 12:17227 (R;FR)

SIMS
See MASS SPECTROSCOPY

SINGLE CRYSTALS
See MONOCRYSTALS

SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY
Collimators
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
Gamma Cameras
Which collimator for SPECT with I-123 and CU-67, 12:16820 (J;US)
Scintillation Counters
Linearity and energy corrections for scintillation cameras used in quantitative single photon emission computed tomography, 12:16821 (J;US)

SITE CHARACTERIZATION
Manuals
Site characterization field manual for near surface geologic disposal of low-level radioactive waste, 12:15422 (R;US)
Water Quality
1986 annual water quality data report for the Waste Isolation Pilot Plant, 12:15488 (R;US)

SITE SELECTION
Evaluation
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project, 12:15421 (R;US)

SITES (REACTOR)
See REACTOR SITES

SIZEWELL NUCLEAR POWER STATION B
See SIZEWELL-B REACTOR

SIZEWELL-B REACTOR
Sizewell, Suffolk, USA
Planning
Probabilistic safety analysis for Sizewell B - Proof of Evidence, established on behalf of the Friends of the Earth, London, within the framework of the Sizewell B Power Station Public Inquiry, 12:16036 (R;DE;In German, English)

SKIN
Beta Dosimetry
Beta-particle dosimetry, 12:16863 (RA;US)
Infrared Spectra
Study of infra-red radiation characteristics: 2, Effect of infra-red radiation heating on the human body, 12:16883 (TG;GB)

SKYRMIONS
See SOLITONS

SLAGS
Viscosity
Fundamental studies on mineral matter behavior in ash-agglomerating coal gasifiers, 12:15271 (R;US)

SLC
See STANFORD LINEAR COLLIDER

SLOWPOKE REACTOR (TORONTO)
See SLOWPOKE-TORONTO REACTOR

SLOWPOKE TYPE REACTORS
See also SLOWPOKE-TORONTO REACTOR
Activation Analysis
Application of the Miniature Neutron Source Reactor, 12:15989 (RA;XA)
Education
MNSR - A satisfactory tool for training and teaching (Miniature Neutron Source Reactor), 12:15990 (RA;XA)
Reactor Control Systems
Control system for the MNSR (Miniature Neutron Source Reactor), 12:15958 (RA;XA)
Uses
MNSR Reactor (Miniature Neutron Source Reactor), 12:15988 (RA;XA)

SLOWPOKE-TORONTO REACTOR
Specifications
Slowpoke-2: Laboratory reactor for neutron irradiation, 12:15987 (RA;XA)
Uses
Slowpoke-2: Laboratory reactor for neutron irradiation, 12:15987 (RA;XA)

SLUDGES
See also SEWAGE SLUDGE

Biochemical Oxygen Demand
Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
Biodegradation
Pulp and paper industry energy impacts through implementation of biotechnologies, 12:16224 (BA;US)
SLUGS (FUEL)
See FUEL RODS
SLURRIES
See also FUEL SLURRIES
Calorimetry
Off-gas chemistry study of melter feed by Springborn Laboratories (Sludge-only and sludge-precipitate feed samples), 12:15425 (R;US)
Fluid Flow
Fluidization mechanisms in slurry flows: Quarterly report, 12:16474 (R;US)
Infrared Spectra
Off-gas chemistry study of melter feed by Springborn Laboratories (Sludge-only and sludge-precipitate feed samples), 12:15425 (R;US)
Pyrolysis
Off-gas chemistry study of melter feed by Springborn Laboratories (Sludge-only and sludge-precipitate feed samples), 12:15425 (R;US)
Pyrolysis Products
Off-gas chemistry study of melter feed by Springborn Laboratories (Sludge-only and sludge-precipitate feed samples), 12:15425 (R;US)
Thermal Gravimetric Analysis
Off-gas chemistry study of melter feed by Springborn Laboratories (Sludge-only and sludge-precipitate feed samples), 12:15425 (R;US)
SLURRIES (FUEL)
See FUEL SLURRIES
SMOKATRON
See ELECTRON-RING ACCELERATORS
SMOKES
Air Pollution
Atmospheric-dispersion index for prescribed burning. Forest Service research paper, 12:16728 (R;US)
SMP DEVICES
See SCANNING MEASURING PROJECTORS
SODIUM
Absorption
Study of high temperature removal of alkali of a pressurized gasification system: Final report, 12:15276 (R;US)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Removal
Complete sodium removal from equipment, 12:15860 (J;US)
SODIUM IODIDE DETECTORS
See NAI DETECTORS
SODIUM SULFIDES
Corrosive Effects
The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
SODIUM-SULFUR BATTERIES
Materials Testing
The corrosion of metals and alloys by sodium polysulfide melts at 350°C, 12:16253 (R;US)
SOILS
Acidification
Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)
Compacting
Review of current research into soil decontamination and volume reduction techniques for purposes of transportation and disposal, 12:15517 (RA;US)
Decontamination
Determination of U-238, Ra-226, and Th-232 by gamma-ray spectrometry in unprocessed soil samples, 12:15524 (RA;US)
Review of current research into soil decontamination and volume reduction techniques for purposes of transportation and disposal, 12:15517 (RA;US)
Depth Dose Distributions
Dose rate conversion factors, 12:17335 (J;US)
Land Pollution
Influence of water running down the stem of trees on the chemical soil characteristics and low vegetation in populations of old beech-trees in different forest stands, 12:16904 (R;DE;In German)
Photon Transport
Dose rate conversion factors, 12:17335 (J;US)
Physical Properties
Physical properties of cultivated soils mixed with coal ash as ameliorant, 12:15309 (R;JP;In Japanese)
Radiation Monitoring
Analysis of uranium and thorium contaminated soils during a cleanup and interment operation, 12:15550 (RA;US)
Correlation between gamma radiation levels and soil radium concentrations at the Edgemont uranium mill site, 12:15549 (RA;US)
Gamma analysis of soil at SEFOR, a decommissioned reactor, 12:16000 (J;US)
In situ monitoring technique for determining post remedial action concentrations of radium in soil, 12:15525 (RA;US)
Radioactivity
Determination of U-238, Ra-226, and Th-232 by gamma-ray spectrometry in unprocessed soil samples, 12:15524 (RA;US)
Rapid estimation of ^{226}Ra in soil for the Grand Junction RASA/UMTRA Project, 12:15532 (RA;US)
Waste Processing
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 1. Literature assessment, waste/soil characterization, loading-rate selection. Final report, 12:16221 (R;US)
Waste/soil treatability studies for four complex industrial wastes: methodologies and results. Volume 2. Waste loading impacts on soil degradation, transformation, and immobilization. Final report, 12:16222 (R;US)
SOIL-STRUCTURE INTERACTIONS
Benchmarks
SSI [soil-structure interactions] and structural benchmarks, 12:16005 (R;US)
SOLANUM
Oncogenic Transformations
Hypervirulence of Agrobacterium tumefaciens A281 is encoded in a region of pTiBo542 outside of T-DNA, 12:16803 (J;US)
SOLAR ABSORBERS
Power Density
Measurement of radiation intensity at the solar tower plant SSPS/CRS of the IEA in Spain, 12:15621 (TG;FR)
SOLAR ACTIVITY
See also SOLAR FLARES
SOLAR PROMINENCES
SOLAR RADIO BURSTS
SOLAR WIND
SUNSPOTS
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR ALPHA PARTICLES
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR BATTERIES
See SOLAR CELL ARRAYS

SOLAR CELL ARRAYS
Calibration
Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
Standards
Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
SOLAR CELLS
See also CASCADE SOLAR CELLS
CONCENTRATOR SOLAR CELLS
SILICON SOLAR CELLS
Adhesives
Chemical bonding technology: Direct investigation of interfacial bonds, 12:15604 (R;US)
Calibration
Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
Electric Contacts
Environmental tests of metallization systems for terrestrial photovoltaic cells, 12:15603 (R;US)
Ink jet printing of silver metallization for photovoltaics: Final technical report for the period 10/1/84 through 9/30/86, 12:15607 (R;US)
Standards
Results of the 1986 NASA/JPL Balloon Flight Solar Calibration Program, 12:15608 (R;US)
SOLAR CORONA
Configuration
Simultaneous solar maximum mission (SMM) and very large array observations of solar active regions. Annual report, 1 September 1985-30 October 1986, 12:17033 (R;US)
Magnetic Fields
Simultaneous solar maximum mission (SMM) and very large array observations of solar active regions. Annual report, 1 September 1985-30 October 1986, 12:17033 (R;US)
Plasma Heating
Coronal heating by magnetic tearing turbulence, 12:16948 (RA;CS)
SOLAR ENERGY
Economics
Renewable energy sources and their uses - application, potentials, economic aspects, 12:16183 (RA;DE;In German)
SOLAR FLARES
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
Gamma Spectrometers
Gamma-ray spectrometer experiment on the solar maximum mission satellite. Final report, 16 October 1984-15 April 1986, 12:17041 (R;US)
MAX '91: an advanced payload for the exploration of high energy processes on the active sun, 12:17040 (R;US)
Ultraviolet Spectrometers
MAX '91: an advanced payload for the exploration of high energy processes on the active sun, 12:17040 (R;US)
X-Ray Spectra
Solar flare x-ray polarimetry. Final scientific report, 1 April 1984-30 September 1986, 12:17034 (R;US)
SOLAR MODELS
See STAR MODELS
SOLAR NEUTRINOS
Prior to July, 1975 information was indexed to NEUTRINOS.
Neutrino Detection
Solar neutrino experiments, 12:17106 (RA;CS)
SOLAR ONE POWER PLANT
See BARSTOW SOLAR PILOT PLANT
SOLAR PROMINENCES
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR PROTON EVENTS
See SOLAR PROTONS
SOLAR PROTONS
Prior to July, 1975 information was indexed to PROTONS.
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR RADIATION
Data
New England solar energy atlas, 12:15596 (R;US)
Diffusion
Light diffusion through clouds and haze, 12:16698 (J;US)
Radiowave Radiation
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Resource Assessment
The SERI Resource Assessment Project's plan for collecting spectral-solar-irradiance data, 12:15597 (R;US)
Velocity
Spectroscopic planetary detection, 12:17019 (RA;US)
X Radiation
Solar-Geophysical Data Number 504, August 1986. Part 2 (comprehensive reports). Data for February 1986, 12:17051 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR RADIO BURSTS
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLAR REFLECTORS
Erosion
Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)
Oxidation
Effect of hard particle impacts on the atomic oxygen survivability of reflector surfaces with transparent protective overcoats, 12:15624 (R;US)
SOLAR SYSTEM
Rings
Research in planetary astronomy at Palomar Observatory, 12:16990 (RA;US)
SOLAR SYSTEM EVOLUTION
Stellar upper mass limit in an OB association and implications for cosmic rays and cosmic abundances, 12:16938 (RA;US)
SOLAR WATER HEATERS
Performance Testing
In-situ performance of solar water heaters: a testing programme. Final report, 12:15623 (R;US)
SOLAR WIND
Solar-Geophysical Data Number 505, September 1986. Part 2 (comprehensive reports). Data for March, and miscellanea, 12:17053 (R;US)
SOLID CLUSTERS
Chemical Reactions
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
SOLID FUELS
See also MIXED OXIDE FUELS
Mathematical Models
Mathematical simulation of fuel materials swelling according to a quasistatic void model, 12:16331 (R;SU;In Russian)
Swelling
Mathematical simulation of fuel materials swelling according to a quasistatic void model, 12:16331 (R;SU;In Russian)

SOLID STATE LASERS
See also NEODYMIUM LASERS
Accuracy
Monochromator wavelength measurement device with six figure accuracy, 12:16471 (BA;US)
Laser Materials
Red laser initiative at Los Alamos, 12:16469 (BA;US)
Sustained performance of a 100 W, 240 Hz alexandrite laser, 12:16470 (BA;US)
Transparent glass ceramics: Laser prospects, 12:16472 (BA;US)
Metering
Monochromator wavelength measurement device with six figure accuracy, 12:16471 (BA;US)
Optical Pumping
Red laser initiative at Los Alamos, 12:16469 (BA;US)
Parametric Analysis
Sustained performance of a 100 W, 240 Hz alexandrite laser, 12:16470 (BA;US)
Performance
ICF drivers: A comparison of some new entries and old standbys, 12:17556 (J;US)
Sustained performance of a 100 W, 240 Hz alexandrite laser, 12:16470 (BA;US)
Wavelengths
Monochromator wavelength measurement device with six figure accuracy, 12:16471 (BA;US)
SOLID STATE PHYSICS
BARC
Annual report of the Nuclear Physics Division [for] period ending December 31, 1982, 12:17190 (R;IN)
Research Programs
Annual report of the Nuclear Physics Division [for] period ending December 31, 1982, 12:17190 (R;IN)
SOLID WASTES
Combustion Products
Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)
Waste Disposal
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report (Salt and salt-laden material), 12:15407 (R;US)
SOLIDS
Atom Transport
Chemical potential in a stressed solid, 12:17341 (R;US)
Electron Beams
Collective excitation of a target by high-density electron beam, 12:17308 (R;SU;In Russian)
Pneumatic Transport
Advanced research in instrumentation and control technology: Capacitance flowmeter, 12:15273 (R;US)
Pipe and bend erosion by pneumatic transport of solids at high temperature: Quarterly report, September-November 1986, 12:15324 (R;US)
Thermodynamic Activity
Chemical potential in a stressed solid, 12:17341 (R;US)
SOLITONS
Astrophysics
Solitons in astrophysics, 12:17405 (RA;CS)
Nonlinear Problems
Algebraic construction of soliton solutions related to sl(2,R) algebra, 12:17364 (RA;SU;In Russian)
Universe
Algebraic construction of soliton solutions related to sl(2,R) algebra, 12:17364 (RA;SU;In Russian)
SOLUTES
Transport
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
SOLVATED ELECTRONS
Hydration
Thermodynamic properties of hydrated electron, 12:16427 (R;FR;In French)
SOLVENT EXTRACTION
Fluorescence Spectroscopy
Laser light-scattering and laser fluorescence studies of solvent extraction systems, 12:16384 (R;US)
Laser Spectroscopy
Laser light-scattering and laser fluorescence studies of solvent extraction systems, 12:16384 (R;US)
SONDES
See PROBES
SOOT
Monitoring
Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)
Production
Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)
Raman Spectra
Conditional sampling for fuel and soot in CARS thermometry, 12:16434 (BA;US)
SORGHUM
Carbon Dioxide Fixation
Effect of carbon dioxide on sorghum yield, root growth, and water use, 12:16906 (J;NL)
Plant Growth
Effect of carbon dioxide on sorghum yield, root growth, and water use, 12:16906 (J;NL)
SOURCE ROCKS
Activation Analysis
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Gamma Logging
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Geologic Models
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
SOUTH AFRICA
Electric-Powered Vehicles
Battery-powered vehicle research in South Africa, 12:16233 (R;ZA)
SOUTH ATLANTIC BIGHT
Coastal Waters
Continental shelf processes affecting the oceanography of the South Atlantic Bight: Progress report, June 1, 1986 to May 31, 1987, 12:16933 (R;US)
SOUTH KOREA
See REPUBLIC OF KOREA
SOUTH TEXAS PROJECT-1 REACTOR
Bay City, Texas, USA
Reactor Decommissioning
Utility perspectives on decommissioning - the accounting involvement, 12:16065 (J;US)
SOUTH TEXAS PROJECT-2 REACTOR
Bay City, Texas, USA
Reactor Decommissioning
Utility perspectives on decommissioning - the accounting involvement, 12:16065 (J;US)
SOUTHERN OSCILLATION
Environmental Effects
Global atmospheric CO_2 distribution and variations from 1968-1982 NOAA/GMCC CO_2 flask sample data, 12:16762 (J;US)
SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR
See SEFOR REACTOR
SOVIET UNION
See USSR
SPACE POWER REACTORS
Fuel Pins
Fuel system and structural alloy considerations for space nuclear reactor systems, 12:15868 (BA;US)
Materials
Assessment of ceramic composites for multimegawatt space nuclear power systems, 12:15867 (R;US)
Materials Testing
Fuel system and structural alloy considerations for space nuclear reactor systems, 12:15868 (BA;US)
SPACE VEHICLES
Radiation Doses
Production of activation products in space-craft components by protons in low earth orbit, 12:17122 (J;US)

SPACECRAFT POWER SUPPLIES
Impact Tests
General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)
MHD Generators
Space-based laser-driven MHD generator: feasibility study. Final report, 12:16187 (R;US)
Safety
General-Purpose Heat Source Development: Safety Verification Test Program. Flyer plate test series, 12:15582 (R;US)
SPACE-TIME
Anisotropy
On permissible space anisotropy, 12:17379 (R;SU;In Russian)
SPECIAL RELATIVITY THEORY
See RELATIVITY THEORY
SPECTRA (FISSION)
See FISSION SPECTRA
SPECTRA (NEUTRON)
See NEUTRON SPECTRA
SPECTROMETERS
See also BETA SPECTROMETERS
COSMIC RAY SPECTROMETERS
ELECTRON SPECTROMETERS
GAMMA SPECTROMETERS
INFRARED SPECTROMETERS
MAGNETIC SPECTROMETERS
NEUTRON SPECTROMETERS
NMR SPECTROMETERS
OPTICAL SPECTROMETERS
TIME-OF-FLIGHT SPECTROMETERS
X-RAY SPECTROMETERS
Analog-to-Digital Converters
Analog-to-digital converter, 12:16631 (R;SU;In Russian)
Resolution
Resolution of spectrometric systems of various types. Problem statement, 12:16610 (R;SU;In Russian)
SPECTROSCOPY
See also LASER SPECTROSCOPY
MASS SPECTROSCOPY
NEUTRON SPECTROSCOPY
Meetings
Analysis of materials (metals, ceramics, minerals) using spectroscopic methods, 12:16390 (R;DE)
SPEED INDICATORS
See VELOCIMETERS
SPENT FUEL CASKS
Design
Effects of high burnup on spent-fuel casks, 12:15910 (J;US)
Fluid Flow
Finite difference solution procedure for convection-diffusion problems in irregular geometries, 12:16480 (J;US)
Heat Transfer
Finite difference solution procedure for convection-diffusion problems in irregular geometries, 12:16480 (J;US)
Performance Testing
Spent-fuel transportation - a success story, 12:15401 (J;US)
Research Programs
Cask technology program activities, 12:16446 (R;US)
Testing
Virginia Power and Department of Energy spent fuel transportation experience, 12:15397 (R;US)
SPENT FUEL ELEMENTS
Corrosion Products
Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities, 12:15402 (J;US)
Crack Propagation
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Oxidation
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Post-Irradiation Examination
Qualification of an LWBR-irradiated fuel assay gauge, 12:15864 (J;US)
Road Transport
Virginia Power and Department of Energy spent fuel transportation experience, 12:15397 (R;US)
Stress Corrosion
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Temperature Effects
Behavior of breached pressurized water reactor spent-fuel rods in an air atmosphere between 250 and 360°C, 12:15400 (J;US)
Transport
Spent-fuel transportation - a success story, 12:15401 (J;US)
SPENT FUEL STORAGE
See also MONITORED RETRIEVABLE STORAGE
Dry Storage
Preliminary characterization of radioactive crud for design of dry spent-fuel handling facilities, 12:15402 (J;US)
Fuel Racks
Seismic behavior of spent-fuel racks supported by aseismic bearing devices, 12:15403 (J;US)
Radionuclide Migration
Mass transfer of soluble species into backfill and rock, 12:15476 (J;US)
Underground Storage
Mass transfer of soluble species into backfill and rock, 12:15476 (J;US)
Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant, 12:15472 (J;US)
SPENT FUELS
Inventories
The Integrated Data Base program: An executive-level data base of spent fuel and radioactive waste inventories, projections, and characteristics, 12:15417 (R;US)
Leaching
Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine, 12:15447 (R;US)
Radioactivity
How well does ORIGEN predict spent LWR [Light Water Reactor] fuel characteristics, 12:15416 (R;US)
Reprocessing
Reprocessing fuel from the Southwest Experimental Fast Oxide Reactor at the Savannah River Plant, 12:15385 (R;US)
The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor, 12:15383 (R;US)
SPENT SHALES
Chemical Composition
Assay products from Green River oil shale, 12:15373 (R;US)
Density
Assay products from Green River oil shale, 12:15373 (R;US)
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Leaching
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
SPHERES
Dielectric Properties
Excitations in small spherical particles, 12:17358 (R;US;In Spanish)
SPHEROMAK DEVICES
See also CTX SPHEROMAK
Currents
Measurement of the line tying current pattern in the proto S-1/C tilt stabilizing structure, 12:17446 (RA;US)
Design
Recent progress of S-1 experiments, 12:17439 (RA;US)
Electric Currents
Current drive by helicity injection in RFP's and spheromaks, 12:17459 (RA;US)
Electron Density
Summary of electron temperature and density measurements in the S-1 spheromak, 12:17444 (RA;US)

Electron Temperature
Summary of electron temperature and density measurements in the S-1 spheromak, 12:17444 (RA;US)
Energy
Internal magnetics of the S-1 Spheromaks, 12:17440 (RA;US)
Hydromagnetic Waves
Observation of Doppler shifts and applied magnetic disturbances in PS-3.5, 12:17457 (RA;US)
Ion Temperature
Observation of Doppler shifts and applied magnetic disturbances in PS-3.5, 12:17457 (RA;US)
Magnet Coils
Critical field index for passive coil stabilization of the shift instability, 12:17458 (RA;US)
Magnetic Field Configurations
Current drive by helicity injection in RFP's and spheromaks, 12:17459 (RA;US)
Equilibrium of the kink source experiment, 12:17456 (RA;US)
Generalized helicity and its time derivative, 12:17451 (RA;US)
Internal magnetics of the S-1 Spheromaks, 12:17440 (RA;US)
Introduction to the m = 1 helicity source, 12:17454 (RA;US)
Spontaneous generation of toroidal magnetic field during spheromak formation in a conical Theta-pinch, 12:17461 (RA;US)
Operation
Recent progress of S-1 experiments, 12:17439 (RA;US)
Plasma Confinement
Initial VUV spectroscopy results from S-1 spheromak, 12:17445 (RA;US)
Plasma Diagnostics
Initial VUV spectroscopy results from S-1 spheromak, 12:17445 (RA;US)
Measurements of radiated power from the S-1 spheromak, 12:17443 (RA;US)
Methods for examining the particle and energy confinement in S-1, 12:17442 (RA;US)
Plasma Guns
Equilibrium of the kink source experiment, 12:17456 (RA;US)
Introduction to the m = 1 helicity source, 12:17454 (RA;US)
Operation of the m = 1 helicity source, 12:17455 (RA;US)
Plasma Instability
Measurement of the line tying current pattern in the proto S-1/C tilt stabilizing structure, 12:17446 (RA;US)
Plasma Waves
Global magnetic fluctuations in S-1 spheromak plasmas and relaxation toward a minimum-energy state, 12:17441 (RA;US)
Power Losses
Measurements of radiated power from the S-1 spheromak, 12:17443 (RA;US)

SPICULES
See SOLAR PROMINENCES

SPIN GLASS STATE
Field Equations
Optimization by a computational neural net, 12:17343 (R;US)

SPIN-OFF
See TECHNOLOGY TRANSFER

SPINOR FIELDS
Matrices
Metric nature of spinor field, 12:17175 (R;SU;In Russian)

SPIROCHAETES
Behavior
Chemtaxis in Spirochaeta aurantia: a possible cation effect. Screening for potential chemorepellents, 12:16834 (RA;US)
Motion
Chemtaxis in Spirochaeta aurantia: a possible cation effect. Screening for potential chemorepellents, 12:16834 (RA;US)

SPR-3 REACTOR
Reactor Maintenance
Robotic system for remote maintenance of a pulsed nuclear reactor, 12:16002 (J;US)

SPRAY PONDS
See COOLING PONDS

SPRAY SYSTEMS (CONTAINMENT)
See CONTAINMENT SPRAY SYSTEMS

SPUTTERING
Reviews
Surface studies by sputtering, 12:17346 (RA;CS)

SQUID DEVICES
Superconducting Quantum Interference Devices
Coaxial Cables
Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)
Superconducting Cables
Reaction of hybrid circuit on the magnetic flux perturbation, 12:16672 (R;SU;In Russian)

STABILITY
Critical Mass
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)

STABLE ISOTOPES
For specific terms, consult the Appendix.
See also ARGON 38
BARIUM 137
BARIUM 138
BERYLLIUM 9
CALCIUM 40
CALCIUM 42
CALCIUM 43
CALCIUM 44
CALCIUM 46
CALCIUM 48
CARBON 12
CARBON 13
CHROMIUM 50
CHROMIUM 52
CHROMIUM 53
CHROMIUM 54
DEUTERIUM
GERMANIUM 76
IRON 54
IRON 56
IRON 58
LITHIUM 6
LITHIUM 7
MANGANESE 55
PHOSPHORUS 31
POTASSIUM 39
POTASSIUM 41
SCANDIUM 45
THULIUM 169
TITANIUM 46
TITANIUM 47
TITANIUM 48
TITANIUM 49
TITANIUM 50
VANADIUM 51
Isotope Separation
Stable isotope customer list and summary of shipments, FY 1986, 12:16408 (R;US)
Sales
Stable isotope customer list and summary of shipments, FY 1986, 12:16408 (R;US)

STACK DISPOSAL
Air Pollution
Characterization of stack emissions from municipal refuse-to-energy systems. Final report, 12:16715 (R;US)

STAINLESS STEEL-16-8-2
Fracture Properties
Fracture toughness of stainless steel welds, 12:16278 (R;US)
Welded Joints
Fracture toughness of stainless steel welds, 12:16278 (R;US)

STAINLESS STEEL-304
Compacting
Microstructural response of rapidly solidified 304 stainless steel powder to three consolidation techniques, 12:16269 (R;US)
Crack Propagation
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Decontamination
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
Decontamination process for hot leg LMFBR components, 12:15852 (RA;US)
Fracture Mechanics
BWR pipe crack remedies evaluation, 12:15764 (R;US)

Intergranular Corrosion
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Laser Welding
Porosity decrease in laser welds of stainless steel using plasma control, 12:16322 (BA;US)
Microstructure
Microstructural response of rapidly solidified 304 stainless steel powder to three consolidation techniques, 12:16269 (R;US)
Reactor Materials
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 3, Influence of the CAN-DECON process on stress corrosion cracking: 1984 constant-extension-rate tests: Final report, 12:15948 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Stress Corrosion
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Compilation of corrosion data on the CAN-DECON process: Volume 5, Influence of the CAN-DECON process on stress corrosion cracking: Summary of testing, 1984-1985: Final report, 12:15768 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)

STAINLESS STEEL-308
Fracture Properties
Fracture toughness of stainless steel welds, 12:16278 (R;US)
Welded Joints
Fracture toughness of stainless steel welds, 12:16278 (R;US)

STAINLESS STEEL-316
Brittleness
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Crack Propagation
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Decontamination
Decontamination process for hot leg LMFBR components, 12:15852 (RA;US)
Fracture Mechanics
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)
Friction Welding
Inertia friction welding of 1100 aluminum to type 316 stainless steel, 12:16295 (R;US)
Reactor Materials
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)
Stress Corrosion
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Technical basis for normal water chemistry guidelines: Review of laboratory studies of water chemistry effects on SCC [stress corrosion cracking], 12:15766 (R;US)

STAINLESS STEEL-347
Crack Propagation
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Fracture Mechanics
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Reactor Materials
BWR pipe crack remedies evaluation, 12:15764 (R;US)
Stress Corrosion
BWR pipe crack remedies evaluation, 12:15764 (R;US)

STAINLESS STEELS
See also STAINLESS STEEL-16-8-2
STAINLESS STEEL-304
STAINLESS STEEL-308
STAINLESS STEEL-316
STAINLESS STEEL-347
Decontamination
Stainless steel decontamination manipulators, 12:15479 (J;US)
Mechanical Properties
The U.S. fast reactor materials and structures program, 12:15866 (BA;US)
Physical Radiation Effects
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Radiation embrittlement of manganese-stabilized martensitic stainless steel, 12:16276 (R;US)
The U.S. fast reactor materials and structures program, 12:15866 (BA;US)
Surface Contamination
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)

STANDARD MAN
See REFERENCE MAN

STANDARD MODEL
Electron-Positron Interactions
Electroweak interactions and new particle searches, 12:17135 (RA;CS)

STANDING CROP
See BIOMASS

STANFORD LINEAR COLLIDER
Drift Chambers
New drift chamber for the Mark II detector at the SLAC linear collider, 12:16653 (J;NL)
Performance of the SLD central drift chamber prototype, 12:16658 (J;NL)
Prototype results of a high resolution vertex drift chamber for the Mark II SLC upgrade detector, 12:16659 (J;NL)
Radiation Transport
Unique radiation problems associated with the SLAC Linear Collider, 12:16516 (R;US)

STAR MODELS
Mathematical models of stars.
Convective Instabilities
Nonlinear RR Lyrae models with time dependent convection, 12:16964 (R;US)
Nonlinear Problems
Nonlinear RR Lyrae models with time dependent convection, 12:16964 (R;US)

STARFIRE TOKAMAK
Availability
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Breeding Blankets
The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets, 12:17533 (J;US)
Computerized Simulation
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Design
The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets, 12:17533 (J;US)
P Codes
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Performance
The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets, 12:17533 (J;US)

Reactor Operation
The influence of reactor operations on the design and performance of tokamaks with solid-breeder blankets, 12:17533 (J;US)

STARS
See also BINARY STARS
GIANT STARS
NEUTRON STARS
VARIABLE STARS
Accretion Disks
Jets, mass outflows and disks associated with young stellar objects, 12:17021 (RA;US)
Infrared Spectra
Planetary optical and infrared imaging, 12:17022 (RA;US)
Mass
Jets, mass outflows and disks associated with young stellar objects, 12:17021 (RA;US)
Pulsations
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Stability
Linear nonadiabatic pulsations of homogeneous ZAMS stars, 12:16965 (R;US)
Ultraviolet Spectra
Stellar observations with the Voyager EUV objective grating spectrograph, 12:17020 (RA;US)

STATE GOVERNMENT
Air Pollution Monitoring
Precision and accuracy assessments for state and local air-monitoring networks, 1984, 12:16720 (R;US)

STATIC MASS SPECTROMETERS
Some proposals on mass separation, precision mass spectrometry and acceleration of radioactive nuclides, 12:16561 (R;SU;In Russian)

STATISTICAL MODELS
Conformal Invariance
Conformal invariance and finite size effects in critical two dimensional statistical models, 12:17158 (R;FR)

STEAM
Chemical Reaction Kinetics
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Water Chemistry
Transport of chemicals in steam cycles, 12:15718 (RA;US)

STEAM CONDENSERS
Operation
Condenser performance improvements, 12:15717 (RA;US)

STEAM COOLANT
See STEAM

STEAM GENERATORS
Availability
Evaluation of feedwater systems for reactor scram reduction, 12:15818 (J;US)
Cleaning
Secondary-side chemical cleaning of Oconee nuclear station steam generators, 12:15825 (J;US)
Control Systems
Palo Verde full-range feedwater control system operating experience, 12:15819 (J;US)
Corrosion
Review of secondary side tube degradation processes in PWR steam generators, 12:15812 (J;US)
Corrosion Protection
Condenser performance improvements, 12:15717 (RA;US)
Crevice Corrosion
Hideout and return of chloride salts in heated crevices prototypic of support plates in steam generators: Topical report, 12:15799 (R;US)
Feedwater
Babcock & Wilcox Company water chemistry guidelines for once-through steam generators and drum boilers, 12:15710 (RA;US)
Evaluation of feedwater systems for reactor scram reduction, 12:15818 (J;US)
Improvement in steam generator level control, 12:15817 (J;US)
Palo Verde full-range feedwater control system operating experience, 12:15819 (J;US)
Heat Transfer
Turbulence force correlation of PWR steam generator tube bundle flow, 12:15834 (J;US)
Use of the Chen boiling heat transfer correlation in once-through steam generator analysis, 12:16089 (J;US)
Hydraulics
Turbulence force correlation of PWR steam generator tube bundle flow, 12:15834 (J;US)
Use of the Chen boiling heat transfer correlation in once-through steam generator analysis, 12:16089 (J;US)
Inconel 600
Understanding and protecting steam generator materials, 12:15813 (J;US)
Leak Testing
Evaluation of sulfur hexafluoride and helium for steam generator leak location: Final report, 12:15771 (R;US)
Leaks
Acoustic leak detection in fossil fueled boilers, 12:15699 (RA;US)
Critical review of acoustic and acoustic emission leak detection in boilers, 12:15701 (RA;US)
Initial feasibility study of halogen tracer method for finding boiler tube leaks, 12:15703 (RA;US)
Mathematical Models
U-tube steam generator model for the DSNP language, 12:15831 (J;US)
Performance
Calculation of once-through steam generator performance using RELAP5/MOD2, 12:15833 (J;US)
Reliability
Evaluation of feedwater systems for reactor scram reduction, 12:15818 (J;US)
Steam generator vessel and feedwater line integrity issues, 12:15810 (J;US)
Ruptures
Calculation RTGV (Steam generator tube rupture), 12:16007 (R;FR;In French)
Stress Analysis
On-line boiler stress and condition analyzer, 12:15702 (RA;US)
Stress Corrosion
Primary side stress corrosion cracking and remedial measures, 12:15809 (J;US)

STEAM INJECTION
Additives
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)

STEAM SYSTEMS
Modifications
Evaluating the safety of nuclear plant changes, 12:16112 (J;US)

STEAM TURBINES
Corrosion
Cost of corrosion and scale in US utilities, 12:15709 (RA;US)
Corrosion Protection
Condenser performance improvements, 12:15717 (RA;US)
Corrosion-resistant coatings for low-pressure steam turbines: Final report, 12:15736 (R;US)
Steam purity recommendations - the Westinghouse experience, 12:15714 (RA;US)
Steam turbine chemistry - a review, 12:15713 (RA;US)
Damage
Water induction detection system: field testing, 12:15693 (RA;US)
Design
Operation and design requirements of cyclic steam turbines, 12:15731 (RA;US)
Failures
Current developments in diagnostic monitoring, 12:15681 (RA;US)
Feedwater
Steam purity recommendations - the Westinghouse experience, 12:15714 (RA;US)

Steam turbine chemistry - a review, 12:15713 (RA;US)
TUGCO's turbine environment index (Texas Utilities Generating Company), 12:15721 (RA;US)
Mechanical Vibrations
Turbine supervisory instrumentation, 12:15692 (RA;US)
Operation
Operation and design requirements of cyclic steam turbines, 12:15731 (RA;US)
Rotors
Monitoring of steam turbine environments for detection of stress corrosion cracking, 12:15694 (RA;US)
On-line rotor crack detection monitoring system, 12:15695 (RA;US)
Shafts
Acoustic emission monitoring of steam turbines: a review of progress, 12:15698 (RA;US)
Water Chemistry
Operation and design requirements of cyclic steam turbines, 12:15731 (RA;US)

STEEL INDUSTRY
See METAL INDUSTRY

STEELS
See also AUSTENITIC STEELS
CARBON STEELS
FERRITIC STEELS
STAINLESS STEELS
Charpy Test
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)
Compressibility
Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)
Density
Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)
Fracture Properties
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)
Hydrogen Embrittlement
Hydrogen degradation of pipeline steels: Final report, 12:16242 (R;US)
Ion Implantation
Temperature influence during nitrogen implantation into steel, 12:16286 (R;FR)
Laser Welding
Plasma plume effects in pulsed carbon dioxide laser spot welding, 12:16321 (BA;US)
Physical Radiation Effects
European effort on materials, 12:16244 (R;FR)
Production
Roles of electricity: Electric steelmaking, 12:16220 (R;US)
Ruptures
Principal modes of rupture encountered in expertise of advanced components, 12:16245 (R;FR;In French)
Thickness
Non-contacting thickness-gauging of fine steel plates, 12:15580 (R;AT;In German)
Wear Resistance
Development of carbide sintering steels with high wear resistance, 12:16281 (R;DE;In German)
Yield Strength
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)

STIMULATED EMISSION DEVICES
See GASERS
LASERS
MASERS

STOCKPILES
Dusts
Field evaluation of windscreens as a fugitive dust control measure for materials storage piles, 12:16704 (RA;US)
Measurement of fugitive emissions in a coal-fired power plant, 12:15753 (RA;US)

STOPPINGS
See VENTILATION BARRIERS

STORAGE BATTERIES
See ELECTRIC BATTERIES

STORAGE DEVICES (DATA)
See MEMORY DEVICES

STORAGE FACILITIES
Decommissioning
Implementation of decommissioning criteria in the conceptual design of the MRS facility, 12:15507 (RA;US)
Radiation Monitoring
Radiological characterization of the Weldon Spring Quarry Weldon Spring, Missouri, 12:15515 (RA;US)

STORAGE RINGS
See also ADONE
SUPERCONDUCTING SUPER COLLIDER
Beam Dynamics
Theoretical aspects of some collective instabilities in high-energy particle storage rings, 12:16590 (R;XC)
Betatron Oscillations
Space-angular distribution of Synchrotron radiation power in electron storage rings with account of betatron oscillations, 12:16592 (R;SU;In Russian)
Construction
Berlin Electron Storage Ring BESSY: a dedicated XUV synchrotron radiation facility, 12:16573 (RA;US)
Origins, and the construction, commissioning and operation of the SRS, 12:16574 (RA;US)
Overview of the UVSOR facility, 12:16576 (RA;US)
Design
Advanced Light Source, a 1-2 GeV synchrotron radiation facility, 12:16589 (RA;US)
Beijing Electron Positron Collider (BEPC) project, 12:16580 (RA;US)
Berlin Electron Storage Ring BESSY: a dedicated XUV synchrotron radiation facility, 12:16573 (RA;US)
Brazilian Synchrotron Radiation Project, 12:16588 (RA;US)
Compact synchrotron radiation source, 12:16581 (RA;US)
Design and status of Hefei light source, 12:16584 (RA;US)
European Synchrotron Radiation Facility, 12:16587 (RA;US)
HESYRL: a dedicated synchrotron radiation laboratory in China, 12:16583 (RA;US)
Optimum undulator trajectories, 12:16532 (BA;US)
Plan and present status of synchrotron radiation applications at HESYRL, 12:16585 (RA;US)
Present status of the SRRC Project, 12:16582 (RA;US)
SUPER-ACO the new Orsay dedicated synchrotron radiation source, 12:16586 (RA;US)
Experiment Planning
Electron ion collisions with a heavy ion cooler ring, 12:17065 (R;US)
Feasibility Studies
European Synchrotron Radiation Facility, 12:16587 (RA;US)
Instability
Modes of storage ring coherent instabilities, 12:16571 (R;US)
Theoretical aspects of some collective instabilities in high-energy particle storage rings, 12:16590 (R;XC)
Operation
Beijing Electron Positron Collider (BEPC) project, 12:16580 (RA;US)
Berlin Electron Storage Ring BESSY: a dedicated XUV synchrotron radiation facility, 12:16573 (RA;US)
Origins, and the construction, commissioning and operation of the SRS, 12:16574 (RA;US)
Orsay synchrotron radiation sources complex, 12:16579 (RA;US)
Overview of the UVSOR facility, 12:16576 (RA;US)
PF experimental hall and some selected current topics in SR experiments, 12:16572 (RA;US)
Present status of SOR-RING, 12:16578 (RA;US)
University-based user facilities: lessons from Tantalus and Aladdin, 12:16577 (RA;US)
Planning
Advanced Light Source, a 1-2 GeV synchrotron radiation facility, 12:16589 (RA;US)
Brazilian Synchrotron Radiation Project, 12:16588 (RA;US)
Design and status of Hefei light source, 12:16584 (RA;US)
HESYRL: a dedicated synchrotron radiation laboratory in China, 12:16583 (RA;US)
Plan and present status of synchrotron radiation applications at HESYRL, 12:16585 (RA;US)
Present status of the SRRC Project, 12:16582 (RA;US)

SUPER-ACO the new Orsay dedicated synchrotron radiation source, 12:16586 (RA;US)
Specifications
Orsay synchrotron radiation sources complex, 12:16579 (RA;US)
Start-Up
Origins, and the construction, commissioning and operation of the SRS, 12:16574 (RA;US)
Present status of SOR-RING, 12:16578 (RA;US)
Synchrotron Radiation
Space-angular distribution of Synchrotron radiation power in electron storage rings with account of betatron oscillations, 12:16592 (R;SU;In Russian)
Uses
The Heidelberg test storage ring for heavy ions and its use for atomic physics, 12:16591 (R;US)
University-based user facilities: lessons from Tantalus and Aladdin, 12:16577 (RA;US)

STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE

STORES
See COMMERCIAL BUILDINGS

STRAND BREAKS
Bioassay
Three methods to determine the yields of DNA double-strand breaks, 12:16858 (R;SU)

STRATEGIC DEFENSE INITIATIVE
See BALLISTIC MISSILE DEFENSE

STRATOSPHERE
Ambient Temperature
Seasonal tropospheric and stratospheric temperature anomalies for the Northern Hemisphere, 1958-1983, 12:16691 (R;US)
Monitoring
Description of data on the Nimbus 7 LIMS map archive tape: ozone and nitric acid, 12:16707 (R;US)

STREAK CAMERAS
Image Intensifiers
Utilisation of image intensifiers used in conjunction with streak cameras, 12:16670 (R;FR;In French)
Time Measurement
Streak camera and picosecond metrology of laser impulses running at high repetitive rates, 12:16602 (R;FR;In French)

STREAMER SPARK CHAMBERS
Data Acquisition Systems
TV event recorder, 12:16630 (R;SU;In Russian)
Spatial Resolution
Investigation of spatial resolution of plastic streamer tubes, 12:16635 (R;SU;In Russian)

STRING MODELS
Treating the interactions of extended particles through breaking and connection of strings.
String theory and holomorphic line bundles, 12:17180 (R;US)
Canonical Transformations
Baryon string model. Part 3. Quantum theory of single-mode configurations of three-string, 12:17361 (R;SU;In Russian)
Energy-Momentum Tensor
Energy-momentum tensor on a Riemann surface, 12:17183 (J;NL)
Fermions
Fermionic string model in spaces of Lie group, 12:17176 (R;SU;In Russian)
Lie Groups
Fermionic string model in spaces of Lie group, 12:17176 (R;SU;In Russian)
Quantization
Baryon string model. Part 3. Quantum theory of single-mode configurations of three-string, 12:17361 (R;SU;In Russian)
Symmetry Breaking
Low energy superstring theory, 12:17185 (BA;NL)
Topological Mapping
Thirring strings, 12:17184 (J;NL)

STRONTIUM
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)

STRONTIUM 90
Geochemistry
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)

STRUCTURAL BUCKLING
See DEFORMATION

STRUCTURAL MATERIALS
See BUILDING MATERIALS

STRUCTURE (CRYSTAL)
See CRYSTAL STRUCTURE

STRUCTURE (MOLECULAR)
See MOLECULAR STRUCTURE

STRUCTURES (MECHANICS)
See MECHANICAL STRUCTURES

STYRENE
Chemical Preparation
The cogeneration of electrical energy and useful chemicals in a solid electrolyte reactor [Final technical report], 12:16420 (R;US)

SUBBITUMINOUS COAL
Combustion Kinetics
Single-particle combustion of Beulah lignite char, 12:15332 (BA;US)
Devolatilization
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Oxidation
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)
Pyrolysis
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Quantitative Chemical Analysis
New methodology for the rapid elemental analysis of coal: Final report for the 1985-86 SOMED [School of Mines and Energy Development] project year, 12:15306 (R;US)
Surface Area
Effects of coal structure on pulverized coal combustion processes: Quarterly technical progress report No. 5 for the period September 1, 1986 to 31 December 1986, 12:15303 (R;US)

SUBSIDENCE (GROUND)
See GROUND SUBSIDENCE

SUBSURFACE STRUCTURES
Background Radiation
Investigation of backgrounds of scintillation and semiconductor detectors in the underground lowbackground laboratory of the Institute for Nuclear Research, the Ukrainian Academy of Sciences, 12:16644 (R;SU;In Russian)

SUBURBS
See URBAN AREAS

SUDDEN IONOSPHERIC DISTURBANCE
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)

SULFATES
See also LITHIUM SULFATES
MANGANESE SULFATES
Atmospheric Chemistry
Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Reduction
Anaerobic chitin degradation as a carbon and hydrogen source for sulfate reduction and methanogenesis in salt marsh bacteria, 12:16826 (RA;US)

SULFIDES
See also HYDROGEN SULFIDES
SODIUM SULFIDES
Biological Effects
Diel vertical movements of bacteria in intertidal streams of Sippewissett Marsh, 12:16833 (RA;US)
Corrosive Effects
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)

SULFUR
Electronic Structure
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
Photoemission
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
X-Ray Spectra
Angle-resolved photoemission extended fine structure, 12:16323 (BA;US)
SULFUR 32 REACTIONS
Incomplete Fusion Reactions
Fusion measurements in light and medium mass heavy-ion reactions: Progress report for the period of June 1, 1986-May 31, 1987, 12:17209 (R;US)
SULFUR 32 TARGET
Neutron Reactions
Neutron scattering on light even-even nuclei, 12:17214 (RA;CS)
SULFUR 38
Secondary Beams
Production of secondary radioactive beams from 44 MeV/u Ar projectiles, 12:16559 (R;FR)
SULFUR COMPOUNDS
See also SULFATES
SULFIDES
SULFUR FLUORIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
SULFUR DIOXIDE
Air Pollution Control
Comprehensive report to Congress: Clean Coal Technology program: Tidd PFBC [pressurized fluidized-bed combustion] demonstration project, 12:15327 (R;US)
Atmospheric Chemistry
Sensitivity analysis of RELMAP (Regional Lagrangian Model of Air Pollution) involving fine and coarse particulate matter, 12:16721 (R;US)
Auger Electron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
Emission
Estimated monthly emissions of sulfur dioxide and oxides of nitrogen for the 48 contiguous states, 1975-1984: Volume 2, Supporting data bases and monthly SO_2 and NO/sub x/ estimates by state, 12:16770 (R;US)
Forecasting
Calculation of emission scenarios for passenger cars in the Netherlands, 12:16208 (R;NL;DU)
Photoelectron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation, 12:17082 (R;US)
SULFUR FLUORIDES
Auger Electron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation (SF_6, SiF_4), 12:17082 (R;US)
Electrolysis
Process for measuring degradation of sulfur hexafluoride in high voltage systems, 12:16422 (P;US)
Photoelectron Spectroscopy
Photoionization of atoms and small molecules using synchrotron radiation (SF_6, SiF_4), 12:17082 (R;US)
SULFUR HYDRIDES
See HYDROGEN SULFIDES
SULFUR SULFIDES
See SULFUR
SUM RULES
Giant Resonance
Isoscalar quadratic energy weighted sum rules and quadrupole moment of giant quadrupole resonance, 12:17285 (R;JP)
Quadrupole Moments
Isoscalar quadratic energy weighted sum rules and quadrupole moment of giant quadrupole resonance, 12:17285 (R;JP)
SUN
Oscillations
Helioseismology, 12:17046 (R;DK)
Solar oscillations, 12:17044 (R;DK)
SUNSPOTS
Solar-Geophysical Data Number 504, August 1986. Part 1 (prompt reports). Data for July 1986, June 1986, and late data, 12:17050 (R;US)
Solar-Geophysical Data Number 505, September 1986. Part 1 (prompt reports). Data for August 1986, July 1986, and late data, 12:17052 (R;US)
Solar records: the Wolf sunspot index and umbral/penumbral ratio, 12:16694 (R;US)
SUPER HIGH FREQUENCY RADIATION
See RADIOWAVE RADIATION
SUPERCOMPUTERS
Algorithms
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions, 12:17668 (BA;US)
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
The role of better algorithms, 12:17680 (BA;US)
Computer Architecture
Execution of parallel loops on parallel processor systems, 12:17666 (BA;US)
Multiprocessor Jacobi algorithms for dense symmetric eigenvalue and singular value decompositions, 12:17668 (BA;US)
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
SK-banyans: A unified class of banyan networks, 12:17671 (BA;US)
The New York University Ultracomputer, 12:17676 (BA;US)
The role of better algorithms, 12:17680 (BA;US)
Computer Calculations
The Computational Physics Program of the National MFE Computer Center, 12:17417 (R;US)
Computer Codes
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Computation: The nexus of nuclear weapon development, 12:17677 (BA;US)
Execution of parallel loops on parallel processor systems, 12:17666 (BA;US)
Parallel structuring of control and resources management systems for parallel programs, 12:17670 (BA;US)
The role of better algorithms, 12:17680 (BA;US)
Control Theory
Parallel structuring of control and resources management systems for parallel programs, 12:17670 (BA;US)
Data-Flow Processing
A pipelined solution method of tridiagonal linear equation systems, 12:17672 (BA;US)
Design
Japanese supercomputer initiatives: Challenge and response, 12:17675 (BA;US)
SK-banyans: A unified class of banyan networks, 12:17671 (BA;US)
The New York University Ultracomputer, 12:17676 (BA;US)
Distributed Data Processing
Distributing hot-spot addressing in large-scale multiprocessors, 12:17673 (BA;US)
Efficiency
Distributing hot-spot addressing in large-scale multiprocessors, 12:17673 (BA;US)
SK-banyans: A unified class of banyan networks, 12:17671 (BA;US)
Executive Codes
Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)

Market
Japanese supercomputer initiatives: Challenge and response, 12:17675 (BA;US)
Memory Devices
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)
Parallel Processing
Compiler generated synchronization for DO loops, 12:17664 (BA;US)
Operating systems and basic software for high-performance parallel architecture, 12:17679 (BA;US)
Optimizing matrix operations on a parallel multiprocessor with a hierarchical memory system, 12:17669 (BA;US)
Parallel structuring of control and resources management systems for parallel programs, 12:17670 (BA;US)
Processor self-scheduling for multiple-nested parallel loops, 12:17665 (BA;US)
SK-banyans: A unified class of banyan networks, 12:17671 (BA;US)
The effectiveness of combining in shared memory parallel computers in the presence of 'hot spots', 12:17674 (BA;US)
Performance
Japanese supercomputer initiatives: Challenge and response, 12:17675 (BA;US)
Plasma Simulation
The Computational Physics Program of the National MFE Computer Center, 12:17417 (R;US)
Programming
Caltech Concurrent Computation Program: Annual report, 1985-86, 12:17645 (R;US)
Research Programs
An overview of computing at Los Alamos, 12:17678 (BA;US)
The New York University Ultracomputer, 12:17676 (BA;US)
Synchronization
Compiler generated synchronization for DO loops, 12:17664 (BA;US)
Translators
Compiler generated synchronization for DO loops, 12:17664 (BA;US)
Uses
Supercomputers and magnetic fusion energy, 12:17624 (BA;US)
Vector Processing
Toward efficient implementations of PCCG (preconditioned conjugate gradient) methods on vector supercomputers. Technical report, 12:17639 (R;US)
SUPERCONDUCTING JUNCTIONS
See also JOSEPHSON JUNCTIONS
Critical Field
Nature of coupling and dimensional crossover in superconducting multilayers, 12:17354 (R;US)
SUPERCONDUCTING MAGNETS
Construction
Design study and supporting experiments for an axially symmetric anchor for a tandem mirror, 12:17537 (J;US)
Design
Design study and supporting experiments for an axially symmetric anchor for a tandem mirror, 12:17537 (J;US)
MINIMARS choke coil design, 12:17607 (J;US)
Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
The differential geometry of twisted coil windings, 12:17609 (J;US)
Differential Geometry
The differential geometry of twisted coil windings, 12:17609 (J;US)
Explosion Welding
Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
Fabrication
The differential geometry of twisted coil windings, 12:17609 (J;US)
Failures
Survey of selected magnet failures and accidents, 12:17550 (J;US)
Joints
Sliding joint and bond development program for the Alcator C-Mod toroidal field coils, 12:17608 (J;US)
Materials Testing
Superconducting magnet radiation effects in fusion reactors, 12:17575 (J;US)
Mechanical Vibrations
Stability and vibration of internal windings of superconducting solenoid magnets, 12:17610 (J;US)
Physical Radiation Effects
Superconducting magnet radiation effects in fusion reactors, 12:17575 (J;US)
Quenching
Heater induced quenches in SSC [Superconducting Super Collider] model dipoles, 12:16565 (R;US)
Stability
Stability and vibration of internal windings of superconducting solenoid magnets, 12:17610 (J;US)
Stresses
Calculation of strain-stressed state of the tyre system of superconducting dipole magnets, 12:16568 (R;SU;In Russian)
Supports
Deflection analysis for an SSC [Superconducting Super Collider] dipole magnet with two external supports, 12:16551 (R;US)
Transients
On the stability of superconducting systems under slightly chance thermal perturbations, 12:17355 (R;SU;In Russian)
Uses
Superconducting materials, 12:16318 (BA;US)
SUPERCONDUCTING QUANTUM INTERFERENCE DEVI
See SQUID DEVICES
SUPERCONDUCTING SUPER COLLIDER
Beam Luminosity
Extending the reach of the SSC [Superconducting Super Collider], 12:16503 (R;US)
Radiation Detectors
Report of the working group on detector simulation, 12:16594 (R;US)
Superconducting Magnets
Deflection analysis for an SSC [Superconducting Super Collider] dipole magnet with two external supports, 12:16551 (R;US)
SUPERCONDUCTORS
Chemical Composition
Ambient-pressure organic superconductor, 12:16416 (P;US)
Thermal Conductivity
Superconducting materials, 12:16318 (BA;US)
SUPERCRITICAL FLOW
See TURBULENT FLOW
SUPERGRAVITY
Compactification
General dimensional reduction of ten-dimensional supergravity and superstring, 12:17388 (J;NL)
Multiplets
Scalar multiplets in N=2 supergravity, 12:17360 (R;SU;In Russian)
Reviews
Supergravity: The basic and beyond, 12:17394 (BA;US)
SUPERLATTICES
Crystallography
Ion beam channeling in superlattices, 12:16366 (BA;US)
Elasticity
Elastic properties of superlattices (Nb/Cu; Au/Cr; Mo/Ni), 12:16260 (R;US)
Ion Channeling
Ion beam channeling in superlattices, 12:16366 (BA;US)
SUPERNOVA REMNANTS
Charge States
Observational study of ion-electron equilibration and of cloud evaporation in supernova remnants under the HEAO-2 guest investigator program. Final project report, 1 June 1985-30 September 1986, 12:17036 (R;US)
Clouds
Observational study of ion-electron equilibration and of cloud evaporation in supernova remnants under the HEAO-2 guest

investigator program. Final project report, 1 June 1985-30 September 1986, 12:17036 (R;US)

SUPERSYMMETRY
Supersymmetry and model building, 12:17179 (R;US)
Instantons
Instantons versus SUSY, 12:17165 (R;SU)
Postulated Particles
On (quasi) stable gluino, 12:17143 (R;SU)
Symmetry Breaking
Instantons versus SUSY, 12:17165 (R;SU)

SUR-100 AACHEN
See SUR-100 SERIES REACTOR

SUR-100 BERLIN
See SUR-100 SERIES REACTOR

SUR-100 BREMEN
See SUR-100 SERIES REACTOR

SUR-100 DARMSTADT
See SUR-100 SERIES REACTOR

SUR-100 HAMBURG
See SUR-100 SERIES REACTOR

SUR-100 KARLSRUHE
See SUR-100 SERIES REACTOR

SUR-100 KIEL
See SUR-100 SERIES REACTOR

SUR-100 MUENCHEN
See SUR-100 SERIES REACTOR

SUR-100 SERIES REACTOR
Specifications
Zero power reactor SUR and its application, 12:15986 (RA;XA)
Uses
Zero power reactor SUR and its application, 12:15986 (RA;XA)

SUR-100 STUTTGART
See SUR-100 SERIES REACTOR

SUR-100 ULM
See SUR-100 SERIES REACTOR

SURFACE MINING
Mining Equipment
Surface and underground coal-mine-equipment population, 1982. Information Circular/1986, 12:15322 (R;US)

SURFACE WATERS
See also LAKES
SWIMMING POOLS
Tritium
Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)

SURFACES
Corrosion
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)
Inspection
Optical fiber inspection system, 12:16676 (P;US)
Meetings
Photon emission from irradiated solids: Proceedings of the Werner Brandt workshop on penetration phenomena, 12:17338 (R;US)
Oxidation
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)
Photon Emission
Photon emission from irradiated solids: Proceedings of the Werner Brandt workshop on penetration phenomena, 12:17338 (R;US)
Remote Sensing
Optical fiber inspection system, 12:16676 (P;US)
Sputtering
Surface studies by sputtering, 12:17346 (RA;CS)
Trends in physics 1984. Proceedings of the 6th general conference of the European Physical Society. Volume 2, 12:17140 (R;CS)
Structural Chemical Analysis
XPS [x-ray photoelectron spectroscopy], AES [Auger electron spectroscopy], RBS [Rutherford backscattering spectroscopy], NRA [nuclear reaction analysis] and laser Raman studies of high temperature corrosion, 12:16294 (R;US)

SURRY POWER STATION UNIT-1
See SURRY-1 REACTOR

SURRY POWER STATION UNIT-2
See SURRY-2 REACTOR

SURRY-1 REACTOR
Gravel Neck, Virginia, USA
Reactor Core Disruption
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Summary of core damage frequency from internal initiators: Surry, 12:16081 (J;US)
Reactor Safety
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)
Risk Assessment
Evolution of PRA methodology and insights since WASH-1400, 12:16085 (J;US)
Smart approach to level-1 probabilistic risk assessment, 12:16080 (J;US)
Summary of core damage frequency from internal initiators: Surry, 12:16081 (J;US)

SURRY-2 REACTOR
Gravel Neck, Virginia, USA
Reactor Safety
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

SURRY-3 REACTOR
Gravel Neck, Virginia, USA
Reactor Safety
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

SURRY-4 REACTOR
Gravel neck, Virginia, USA
Reactor Safety
Surry severe-accident containment load calculations using HMC, 12:16143 (J;US)

SUSPENSIONS (FUEL)
See FUEL SLURRIES

SWEAT GLANDS
See SKIN

SWEDEN
Energy Policy
Wind energy activities in Sweden, 12:15638 (BA;US)
Wind Power
Wind energy activities in Sweden, 12:15638 (BA;US)

SWIMMING POOLS
Dehumidifiers
Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)
Heat Pumps
Gas engine driven heat pump dehumidification system at the Farnborough Recreation Centre, 12:16199 (R;GB)

SWINE
Lethal Radiation Dose
Animal mortality resulting from uniform exposures to photon radiations: Calculated LD_{50}s and a compilation of experimental data, 12:16859 (R;US)
Medicine
Swine in biomedical research. Vol. 3, 12:16793 (B;US)
Meetings
Swine in biomedical research. Vol. 3, 12:16793 (B;US)

SWITZERLAND
Geology
Exploratory borehole Boettstein: Investigation report. Text volume, 12:15430 (R;CH;In German)
Rock Drilling
Exploratory borehole Boettstein: Investigation report. Text volume, 12:15430 (R;CH;In German)

Wind Power
Development of a maintenance free 10 KW windgenerator, 12:15664 (BA;US)
SYMPOSIA
See MEETINGS
SYNCHROPHASOTRONS
See SYNCHROTRONS
SYNCHROTRON RADIATION
Uses
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
SYNCHROTRON RADIATION SOURCES
See also NSLS
Optical Properties
Scientific opportunities at the proposed 6-7 GeV Advanced Photon Source, 12:16539 (R;US)
Uses
Scientific opportunities at the proposed 6-7 GeV Advanced Photon Source, 12:16539 (R;US)
SYNCHROTRONS
See also EREVAN SYNCHROTRON
FERMILAB ACCELERATOR
FERMILAB TEVATRON
IPNS-I SYNCHROTRON
KEK SYNCHROTRON
NSLS
SERPUKHOV SYNCHROTRON
Beam Dynamics
Design and modeling considerations for SSRL Beam Line Wunder, 12:16570 (BA;US)
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
Beam Transport
Design and modeling considerations for SSRL Beam Line Wunder, 12:16570 (BA;US)
Design
Design and modeling considerations for SSRL Beam Line Wunder, 12:16570 (BA;US)
Mathematical Models
Design and modeling considerations for SSRL Beam Line Wunder, 12:16570 (BA;US)
Photoemission
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
Storage Rings
Electron ion collisions with a heavy ion cooler ring, 12:17065 (R;US)
X Radiation
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
SYNROC
See SYNTHETIC ROCKS
SYNTHESIS GAS
Synthesis
Liquefaction of natural gas to methanol for shipping and storage, 12:15589 (R;US)
Methanol for transportation of natural gas values, 12:15587 (R;US)
SYNTHETIC FUELS
Meetings
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
Research Programs
Petroleum and natural gas in the Nuclear Research Centre Juelich. Proceedings, 12:16159 (R;DE;In German)
SYNTHETIC ROCKS
Comparative Evaluations
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
Leaching
Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
SYNTHINE PROCESS
See FISCHER-TROPSCH SYNTHESIS
SYRIAN HAMSTER
See HAMSTERS
SYSTEMS ANALYSIS
Used in the fields of technology research and management for problems such as the calculation of failure probabilities and for reliability studies of systems and components.
D Codes
Deriving properties of systems from properties of parts and lists of connections, 12:17640 (R;US)

T

TAIWAN
Nuclear Power Plants
Validation of seismic soil-structure interaction analysis methods: EPRI [Electric Power Research Institute]/NRC [Nuclear Regulatory Commission] cooperation in Lotung, Taiwan, experiments, 12:16019 (R;US)
TANDEM ELECTROSTATIC ACCELERATORS
Prior to February 1979,information was indexed to Van de Graaff Accelerators.
Nuclear Physics
Report of the joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators (II), 12:17200 (R;JP)
Radiochemistry
Report of the joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators (II), 12:17200 (R;JP)
TANDEM MIRROR DEVICES
See TMR REACTORS
TMX DEVICES
TANDEM MIRROR TYPE REACTORS
See TMR REACTORS
TANK FARMS
See STORAGE FACILITIES
TANTALATES
Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Phase Transformations
The role of point defects on structural phase transitions: Progress report for the year 1986-1987 (Li-doped $KMnF_3$, $KZnF_3$; $K(Ta,Nb)O_3$), 12:16355 (R;US)
TANTALUM
Surface Coating
Modification of the properties of metal overlayers on Nb(110) and Ta(110), 12:16241 (R;US)
X-Ray Fluorescence Analysis
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)
TANTALUM 181 TARGET
Proton Reactions
Four-dimentional hadron jets-universal characteristics of particle multiple production, 12:17201 (R;SU;In Russian)
TANTALUM COMPOUNDS
See also TANTALATES
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
TAR SAND OIL
See BITUMENS
TAR SANDS
See OIL SANDS
TARAPUR-1 REACTOR
Boisar, Maharastra, India

Fission Product Release
Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Fuel Rods
Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Reactor Accidents
Tarapur dual cycle BWR - analysis of steam generator bypass incident, 12:15762 (R;IN)
TARAPUR-2 REACTOR
Boisar, Maharastra, India
Fission Product Release
Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Fuel Rods
Experience in monitoring the BWR [boiling water reactor] fuel behaviour and fission product releases during off normal conditions, 12:16035 (R;DE)
Reactor Accidents
Tarapur dual cycle BWR - analysis of steam generator bypass incident, 12:15762 (R;IN)
TARGET CHAMBERS
Temperature Measurement
Setup for studying targets irradiated by high density proton beam, 12:16554 (R;SU;In Russian)
TATB
Detonations
Short pulse initiation of detonation in a TATB explosive, 12:16680 (BA;US)
TEARING INSTABILITY
Magnetic Field Reversal
Reverse flow and current filamentation in the nonlinear tearing mode, 12:17403 (RA;CS)
TECHNOLOGY TRANSFER
Brookhaven National Laboratory: Technology transfer report, Fiscal year 1983, 12:16158 (R;US)
TELEMETRY
Advanced sensors, telecommunications and data processing: Technological spin-offs from the Strategic Defense Initiative, 12:17632 (R;US)
TELESCOPE COUNTERS
Development of an universal particle telescope with large dynamics for light and medium heavy fragments, 12:16612 (R;DE;In German)
TELLURIUM 132
Computerized Simulation
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
Structural Chemical Analysis
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
TEMPERATURE (AMBIENT)
See AMBIENT TEMPERATURE
TENNESSEE
Oil Shale Deposits
Identification of organic compounds in the bitumen of Chattanooga oil shale, 12:15374 (J;US)
TENNESSEE VALLEY AUTHORITY
Fossil-Fuel Power Plants
Cycle chemistry: sampling points and frequencies, presentation, and use of analytical data, 12:15725 (RA;US)
TERRESTRIAL ECOSYSTEMS
Mapping
Major world ecosystem complexes ranked by carbon in live vegetation: a database, 12:16710 (R;US)
Soil Chemistry
Forms in which aluminium is bound and equilibria of aluminium in gravitational water in acid soils, 12:16775 (R;DE;In German)
TERTIARY RECOVERY
See ENHANCED RECOVERY
TEST FACILITIES
See also FELIX FACILITY
TRITIUM SYSTEMS TEST ASSEMBLY
Design
Fluidization mechanisms in slurry flows: Quarterly report, 12:16474 (R;US)
Diagnostic Techniques
Testing and evaluation of heat recovery/seed recovery: Annual technical progress report, april 1981-March 1982, 12:16186 (R;US)
Materials Testing
Testing and evaluation of heat recovery/seed recovery: Annual technical progress report, april 1981-March 1982, 12:16186 (R;US)
Reactor Safety Experiments
TRAC analysis of upper plenum thermal-hydraulic phenomena in the slab core test facility, 12:16088 (J;US)
TEST FAST BREEDER REACTOR KALPAKKAM
See KALPAKKAM LMFBR REACTOR
TETRAHYDROFURAN
Mutagen Screening
Chemical characterization of materials from a close-coupled catalytic-catalytic two-stage coal liquefaction process, 12:15293 (RA;US)
TETRAHYDRONAPHTHALENE
See TETRALIN
TETRALIN
Density
Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86, 12:15302 (R;US)
Viscosity
Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86, 12:15302 (R;US)
TEVATRON
See FERMILAB TEVATRON
TEXACO GASIFICATION PROCESS
Pilot Plants
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
Raw Materials
Pilot plant evaluation of Illinois No. 6 and Pittsburgh No. 8 coal for the Texaco coal gasification process: Final report, 12:15288 (R;US)
TEXAS
Brines
Geochemistry of Ca, Sr, Ba and Ra sulfates in some deep brines from the Palo Duro basin, Texas, 12:15350 (J;US)
Salt Deposits
Alternative methods to manage waste salt from repository excavation in the Deaf Smith County and Swisher County locations, Texas: A scoping study: Technical report, 12:15407 (R;US)
Wind Power
Wind characteristics, northwest Texas region, 12:15634 (BA;US)
TEXAS EXPERIMENTAL TOKAMAK
See TEXT DEVICES
TEXT DEVICES
Beam Injection Heating
Injection and trapping of intense neutralized ion beams in closed magnetic configuration, 12:17481 (RA;US)
TFCX REACTORS
Research Programs
Demountable toroidal fusion core facility for toroidal physics optimization and fusion engineering research, 12:17586 (J;US)
TFTR DEVICE
See TFTR TOKAMAK
TFTR REACTORS
See TFTR TOKAMAK
TFTR TOKAMAK
Basements
TFTR basement radiation fluence calculations and comparisons with measurements, 12:17571 (J;US)
Breeding Blankets
Lithium Blanket Module (LBM) dosimetry measurements at the LOTUS 14-MeV neutron source facility, 12:17526 (J;US)

Overview of the TFTR Lithium Blanket Module program, 12:17523 (J;US)
Electrical Insulators
Development of large high-voltage pressure insulators for the Princeton TFTR [Tokamak Fusion Test Reactor] flexible transmission lines, 12:15760 (R;US)
Gamma Radiation
TFTR basement radiation fluence calculations and comparisons with measurements, 12:17571 (J;US)
Neutron Fluence
TFTR basement radiation fluence calculations and comparisons with measurements, 12:17571 (J;US)
Radiation Doses
TFTR offsite dose levels from fusion radiation and effluent releases, 12:17553 (J;US)
THERMAL DECOMPOSITION
See PYROLYSIS
THERMAL NEUTRONS
Gases
Difference equation of neutron thermalization in vibrational-nonequilibrium medium, 12:17311 (R;SU;In Russian)
Inelastic Scattering
Temperature dependence of the generalized frequency water spectrum, 12:17307 (R;SU;In Russian)
THERMAL POLLUTION (AIR)
See AIR POLLUTION
THERMAL POLLUTION (WATER)
See WATER POLLUTION
THERMAL POWER PLANTS
See also COMBINED-CYCLE POWER PLANTS
FOSSIL-FUEL POWER PLANTS
NUCLEAR POWER PLANTS
REFUSE-FUELED POWER PLANTS
WOOD-FUEL POWER PLANTS
Blowers
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
Compressors
Detection of turbomachine blading problems using on and off-line monitoring, 12:15689 (RA;US)
Corrosion
New approach for diagnostic monitoring of wear, erosion and corrosion in utility applications, 12:15704 (RA;US)
Cracks
Radiometric detection of cracks on stationary and moving surfaces, 12:15707 (RA;US)
Erosion
New approach for diagnostic monitoring of wear, erosion and corrosion in utility applications, 12:15704 (RA;US)
Feedwater Heaters
Leak detection by acoustic emission monitoring in power plant high pressure preheaters, 12:15700 (RA;US)
Gas Turbines
Detection of turbomachine blading problems using on and off-line monitoring, 12:15689 (RA;US)
Maintenance
Mechanitrack system, 12:15697 (RA;US)
Mechanical Vibrations
Laser doppler measurement of torsional vibrations, 12:15705 (RA;US)
Pumps
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Steam Generators
Critical review of acoustic and acoustic emission leak detection in boilers, 12:15701 (RA;US)
Steam Turbines
Acoustic emission monitoring of steam turbines: a review of progress, 12:15698 (RA;US)
Monitoring of steam turbine environments for detection of stress corrosion cracking, 12:15694 (RA;US)
On-line rotor crack detection monitoring system, 12:15695 (RA;US)
Turbine supervisory instrumentation, 12:15692 (RA;US)
Update on an acoustic doppler technique for detecting resonant turbine blades, 12:15708 (RA;US)
Water induction detection system: field testing, 12:15693 (RA;US)
Turbogenerators
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
On-line diagnosis of turbine-generators using artificial intelligence, 12:15696 (RA;US)
San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Start-up support and trouble shooting for multi-bearing machine, 12:15686 (RA;US)
Turbine supervisory instrumentation, 12:15692 (RA;US)
Vibration signature analysis at Philadelphia Electric, 12:15690 (RA;US)
Wear
New approach for diagnostic monitoring of wear, erosion and corrosion in utility applications, 12:15704 (RA;US)
THERMAL SPRINGS
Geothermometry
Low-temperature geothermal assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah, 12:15625 (R;US)
THERMONUCLEAR DEVICES
See also ICF DEVICES
Breeding Blankets
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)
THERMONUCLEAR FUELS
Cost Benefit Analysis
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
THERMONUCLEAR POWER PLANTS
Availability
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Computerized Simulation
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Cost Estimation
A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
Economic comparison of fusion power plant designs, 12:17592 (J;US)
Design
An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
Economic comparison of fusion power plant designs, 12:17592 (J;US)
Economic Analysis
A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
Economic comparison of fusion power plant designs, 12:17592 (J;US)
ICF Devices
A standard method for economic analyses of inertial confinement fusion power plants, 12:17590 (J;US)
P Codes
Three-state model for fusion reactor plant availability analysis, 12:17593 (J;US)
Reviews
Fusion power: One answer to U.S. energy needs in the 21st century, 12:17625 (BA;US)
Tokamak Type Reactors
An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
Water Treatment
Water detritiation for present and future fusion plants, 12:17613 (J;US)
THERMONUCLEAR REACTIONS
(For use only with the phenomenon, not with THERMONUCLEAR REACTORS.)
Cross Sections
Requirements for charged-particle reaction cross sections in the d-d, d-t, t-t, and d-^{3}He fuel cycles, 12:17484 (R;US)

THERMONUCLEAR REACTOR MATERIALS

Ablation
Fusion surface material melting, ablation and ejection under high heat loading, 12:17579 (J;US)

Albedo
Fast and intermediate energy neutron albedos for fusion materials, 12:17623 (J;US)

Brittleness
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)

Charpy Test
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)

Corrosion Products
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)

Crack Propagation
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)

Data Base Management
COVFILS-2: Neutron data and covariances for sensitivity and uncertainty analysis, 12:17622 (J;US)

Evaporation
Scaling of vaporization and condensation in heavy ion fusion reactors, 12:17565 (J;US)

Fatigue
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)

Fracture Mechanics
Incorporating plastic collapse into the linear elastic fracture mechanics methodology in determining crack propagation lifetimes, 12:17574 (J;US)

Fracture Properties
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)

Heat Transfer
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)

Magnetohydrodynamics
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)

Mathematical Models
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)

Melting
Fusion surface material melting, ablation and ejection under high heat loading, 12:17579 (J;US)

Neutron Transport Theory
Fast and intermediate energy neutron albedos for fusion materials, 12:17623 (J;US)

Physical Radiation Effects
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Irradiation devices for fusion reactor materials results obtained from irradiated lithium aluminate at the OSIRIS reactor, 12:17429 (R;FR)
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)

Pressure Drop
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)

Pressure Effects
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)

Reliability
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)

Safety
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)

Strains
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)

Swelling
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)

Temperature Effects
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Fusion surface material melting, ablation and ejection under high heat loading, 12:17579 (J;US)
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)

Vapor Condensation
Scaling of vaporization and condensation in heavy ion fusion reactors, 12:17565 (J;US)

Yield Strength
Recent progress in subsized Charpy impact specimen testing for fusion reactor materials development, 12:17573 (J;US)

THERMONUCLEAR REACTORS

For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.

See also D-T REACTORS
ION BEAM FUSION REACTORS
LASER FUSION REACTORS
TOKAMAK TYPE REACTORS

Benchmarks
U.S./JAERI calculational benchmarks for nuclear data and codes intercomparison, 12:17589 (J;US)

Breeding Blankets
A model for the mechanical interaction between solid breeder and cladding materials, 12:17601 (J;US)
Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor, 12:17498 (J;US)
Entry length effects in liquid metal fusion blankets, 12:17521 (J;US)
Experimental and analytical investigations of magnetohydrodynamic flows near the entrance to a strong magnetic field, 12:17522 (J;US)
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Fission reactor experiments for solid breeder blankets, 12:17531 (J;US)
Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
Neutronic optimization of a LiAlO/sub 2/ solid breeder blanket, 12:17604 (J;US)
Nuclear performance optimization of the molten-salt fusion breeder, 12:17534 (J;US)
Required momentum, heat, and mass transport experiments for liquid metal blankets, 12:17530 (J;US)
Status of fusion reactor blanket design, 12:17510 (J;US)
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Techniques for measurement of velocity in liquid-metal MHD flows, 12:17518 (J;US)
The bowing of solid breeder rods in a pin-type fusion reactor, 12:17602 (J;US)
Thermodynamic performance of ceramic tritium breeding blanket material, 12:17580 (J;US)
Trade-off study of liquid metal self-cooled blankets, 12:17595 (J;US)

Computer Codes
U.S./JAERI calculational benchmarks for nuclear data and codes intercomparison, 12:17589 (J;US)

Computer-Aided Design
Supercomputers and magnetic fusion energy, 12:17624 (BA;US)

Cryostats
Theoretical assessment of a proposal for the simplified determination of critical loads of elastic shells, 12:17437 (R;DE)

Data Base Management
U.S./JAERI calculational benchmarks for nuclear data and codes intercomparison, 12:17589 (J;US)
Design
Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor, 12:17498 (J;US)
Fusion reactor options and alternatives for the RFP, 12:17503 (J;US)
Geometrical, spectral and temporal differences between ICF and MCF reactors and their impact on blanket nuclear parameters, 12:17597 (J;US)
IPFR, Integrated Pool Fusion Reactor Concept, 12:17497 (J;US)
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Superconducting magnet radiation effects in fusion reactors, 12:17575 (J;US)
Divertors
Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor, 12:17498 (J;US)
Engineering
Compact fusion engineering research facility based upon the LITE concept, 12:17500 (J;US)
F Codes
Issues and test requirements in radiation shielding of fusion reactors, 12:17532 (J;US)
First Wall
A model for first-wall thermal response to plasma energy deposition, 12:17517 (J;US)
First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
Isotope Production
Radioisotope production in fusion reactors, 12:17506 (J;US)
Limiters
Design window for liquid metal-cooled limiters, 12:17578 (J;US)
Materials Testing
Ceramics for fusion devices, 12:17629 (BA;US)
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Plasma-material interactions, 12:17630 (BA;US)
Radiation effects on structural ceramics in fusion, 12:17572 (J;US)
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Meetings
Conference on thermonuclear reactors, 12:17585 (J;US)
Performance Testing
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Pulse Techniques
Compact fusion engineering research facility based upon the LITE concept, 12:17500 (J;US)
Radioactive Aerosols
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Reactor Accidents
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Some safety considerations of liquid lithium as a fusion breeder material, 12:17549 (J;US)
Survey of selected magnet failures and accidents, 12:17550 (J;US)
Reactor Safety
Inherent/passive safety for fusion, 12:17546 (J;US)
Research Programs
Compact fusion engineering research facility based upon the LITE concept, 12:17500 (J;US)
High field superconducting magnets (12 T and greater) for fusion applications, 12:17606 (J;US)
Supercomputers and magnetic fusion energy, 12:17624 (BA;US)
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Reverse-Field Pinch
Applications of the Integrated-Blanket-Coil concept to the compact reversed-field pinch reactor, 12:17498 (J;US)
Safeguards
Inherent/passive safety for fusion, 12:17546 (J;US)
Safety
Fusion safety status report, 12:17434 (R;XA)
Shielding
Issues and test requirements in radiation shielding of fusion reactors, 12:17532 (J;US)
Shields
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Size
Fusion reactor options and alternatives for the RFP, 12:17503 (J;US)
Supercomputers
Supercomputers and magnetic fusion energy, 12:17624 (BA;US)
Superconducting Magnets
Superconducting magnet radiation effects in fusion reactors, 12:17575 (J;US)
Survey of selected magnet failures and accidents, 12:17550 (J;US)
The differential geometry of twisted coil windings, 12:17609 (J;US)
Surface Contamination
Laser generation of particles to simulate aerosols from fusion systems, 12:17552 (J;US)
Uses
Radioisotope production in fusion reactors, 12:17506 (J;US)
The fusion applications study - FAME, 12:17505 (J;US)
Vacuum Systems
First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)

THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS

THF
See TETRAHYDROFURAN

THICKNESS GAGES
Accuracy
Non-contacting thickness-gauging of fine steel plates, 12:15580 (R;AT;In German)
Design
Tube wall thickness measurement apparatus, 12:16675 (P;US)
Operation
Tube wall thickness measurement apparatus, 12:16675 (P;US)

THIN FILMS
Fabrication
Development of optical thin film technology for lasers and synchrotron radiation, 12:16348 (R;IN)
Optical Equipment
Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)
Radiation Transport
Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)
Tunnel Effect
Thin-film chemical sensors based on electron tunneling: Final report, 12:17342 (R;US)

THIO COMPOUNDS
See ORGANIC SULFUR COMPOUNDS

THIOBACILLUS FERROXIDANS
Enhancement of coal quality by microbial demetalization and desulfurization, 12:15269 (R;US)

THIOETHERS
See SULFIDES

THIRRING MODEL
String Models
Thirring strings, 12:17184 (J;NL)

THORIUM 232 TARGET
Argon 40 Reactions
Formation and decay of hot nuclei, 12:17240 (R;FR)
Fission
Formation and decay of hot nuclei, 12:17241 (R;FR)

Nickel 58 Reactions
Formation and decay of hot nuclei, 12:17241 (R;FR)
Formation and decay of hot nuclei, 12:17240 (R;FR)
Nitrogen 14 Reactions
Formation and decay of hot nuclei, 12:17240 (R;FR)
THORIUM 234
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
THORIUM B
See LEAD 212
THORIUM FLUORIDES
Spectra
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)
THORIUM OXIDES
Catalytic Effects
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Chemical Analysis
X-ray fluorescence method for the determination of potassium, rubidium and cesium in thoria, 12:16374 (R;IN)
Corrosion Resistance
In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)
NMR Spectra
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
THORIUM X
See RADIUM 224
THREE MILE ISLAND-2 REACTOR
Dauphin County, Pennsylvania, USA
Containment Buildings
Operational experiences with a remote core-boring device, 12:16130 (J;US)
Robotics development at TMI-2, 12:16129 (J;US)
Corium
TMI-2 lower vessel debris examinations, 12:16024 (R;US)
Decontamination
Fast sorting measurement technique to determine decontamination priority, 12:16013 (RA;US)
Post-accident recovery operations at TMI-2, 12:16010 (RA;US)
Postaccident chemical decontamination: Method development: Final report, 12:16030 (R;US)
TMI-2 post-accident dose reduction through coating removal, 12:15518 (RA;US)
Meltdown
An experimental study of isothermal and boiling liquid jets, 12:16062 (R;US)
Radiation Protection
Post-accident recovery operations at TMI-2, 12:16010 (RA;US)
Training program requirements for remote equipment operators in nuclear facilities, 12:16454 (J;US)
Reactor Accidents
Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel, 12:16116 (J;US)
Integrated defueling system for Three Mile Island Unit 2, 12:16127 (J;US)
Preliminary results of the TMI-2 core bores, 12:16025 (R;US)
Robotics development at TMI-2, 12:16129 (J;US)
Use of CADD/CAE for remote vehicle system mission planning, 12:16455 (J;US)
Reactor Cooling Systems
Postaccident chemical decontamination: Method development: Final report, 12:16030 (R;US)
Reactor Core Restraints
Gamma-scanning the primary shield cavity under the TMI-2 reactor vessel, 12:16116 (J;US)
Reactor Dismantling
Integrated defueling system for Three Mile Island Unit 2, 12:16127 (J;US)
Reactor Fueling
Drop tests of the Three Mile Island knockout canister, 12:15800 (R;US)
Reactor Safety
Preliminary results of the TMI-2 core bores, 12:16025 (R;US)
Reactor Vessels
TMI-2 lower vessel debris examinations, 12:16024 (R;US)
Surface Contamination
Composite empirical and analytical method to predict the magnitude of surface contamination in semi-accessible areas, 12:15506 (RA;US)
THREE-BODY PROBLEM
Adiabatic Approximation
Natural coordinates for the three-body problem in adiabatic approximation, 12:17378 (R;SU;In Russian)
Coordinates
Natural coordinates for the three-body problem in adiabatic approximation, 12:17378 (R;SU;In Russian)
Faddeev Equations
Solution of Faddeev differential equations for scattering problem in three identical particle system. Calculation algorithm. The finite-dimensional approximation method, 12:17177 (R;SU;In Russian)
Monte Carlo Method
Variational Monte Carlo calculations of few-body nuclei, 12:17206 (R;US)
THULIUM 163
Multipole Transitions
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Rotational States
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
THULIUM 165
Multipole Transitions
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Rotational States
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
THULIUM 167
Lifetime
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Multipole Transitions
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Rotational States
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
THULIUM 169
Multipole Transitions
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Rotational States
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
THULIUM 171
Multipole Transitions
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
Rotational States
Probabilities of electromagnetic transitions in odd thulium nuclei, 12:17232 (R;SU;In Russian)
THULIUM OXIDES
X-Ray Fluorescence Analysis
X-ray fluorescence analysis of thulium oxide/oxalate for rare earth impurities, 12:16378 (R;IN)
TIBIA
In vivo determination of tibial lead by K x-ray fluorescence with a ^{109}Cd source, 12:16885 (R;US)
TIGHT SANDS
See SANDSTONES

TIME RESOLUTION
Laser Radiation
Streak camera and picosecond metrology of laser impulses running at high repetitive rates, 12:16602 (R;FR;In French)
TIME-OF-FLIGHT SPECTROMETERS
Double-arm time-of-flight spectrometer for the DEMAS installation, 12:16629 (R;SU;In Russian)
Neutron Detection
Time of flight spectrometer for the measurement of gamma correlated neutron spectra, 12:16627 (RA;CS)
TIN 120 TARGET
Proton Reactions
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
TIN COMPOUNDS
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
TITANIUM
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
X-Ray Fluorescence Analysis
Determination of Ti, Cr, Cu and Ta in niobium oxide by X-ray fluorescence method, 12:16381 (R;IN)
TITANIUM 46
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
TITANIUM 47
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
TITANIUM 48
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
TITANIUM 49
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
TITANIUM 50
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
TITANIUM ALLOYS
Chemical Composition
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Corrosion Resistance
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Mechanical Properties
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Phase Studies
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
TITANIUM COMPOUNDS
See also TITANIUM OXIDES
Binding Energy
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Electronic Structure
Estimated core electron binding energies and their application in the interpretation of valence ionization potentials, 12:16417 (J;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta^2-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
TITANIUM ISOTOPES
See also TITANIUM 46
TITANIUM 47
TITANIUM 48
TITANIUM 49
TITANIUM 50
Argon 40 Reactions
Search for impact parameter dependence of two-particle correlations using exclusive observables in nucleus-nucleus collisions at intermediate energies, 12:17219 (R;FR)
Neutron Reactions
Neutron reactions on Ti isotopes from near threshold to 20 MeV, 12:17271 (RA;CS)
TITANIUM OXIDES
Fracture Mechanics
Fracture mechanisms in lead zirconate titanate ceramics, 12:16338 (BA;US)
Heating
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
Phase Transformations
High temperature Raman studies of phase transitions in thin film dielectrics, 12:16367 (J;US)
Reduction
Pt-Ti alloy formation from high-temperature reduction of a titania-impregnated Pt catalyst: implications for strong metal-support interaction, 12:16300 (J;US)
TMR REACTORS
After-Heat Removal
Passive decay heat removal in liquid-metal cooled reactors, 12:17548 (J;US)
Breeding Blankets
An inherently safe tandem mirror fusion blanket concept, 12:17512 (J;US)
Cost study of the ESPRESSO blanket for a tandem mirror reactor, 12:17599 (J;US)
Thermal-hydraulic study of the ESPRESSO blanket for a Tandem Mirror Reactor, 12:17605 (J;US)
ECR Heating
Design study and supporting experiments for an axially symmetric anchor for a tandem mirror, 12:17537 (J;US)
Loss Cone Instability
An alpha particle distribution function for mirror loss-cone type instability calculations, 12:17419 (J;US)
Loss of Flow
Passive decay heat removal in liquid-metal cooled reactors, 12:17548 (J;US)
Superconducting Magnets
Design study and supporting experiments for an axially symmetric anchor for a tandem mirror, 12:17537 (J;US)

TMX DEVICES
MHD Equilibrium
Parallel current flow in the Phaedrus tandem mirror machine, 12:17423 (BA;US)
Plasma Confinement
Recent operation of the tandem mirror experiment-upgrade, 12:17420 (BA;US)
Plasma Diagnostics
Neutral beam probe for potential measurements in Phaedrus minimum-B end plug, 12:17421 (BA;US)
Thermal Barriers
Recent operation of the tandem mirror experiment-upgrade, 12:17420 (BA;US)
TOKAMAK DEVICES
See also ALCATOR DEVICE
ASDEX TOKAMAK
COMPACT IGNITION TOKAMAK
SPHEROMAK DEVICES
TEXT DEVICES
Beam Injection Heating
Injection and trapping of intense neutralized ion beams in closed magnetic configuration, 12:17481 (RA;US)
Limiters
Surface analysis of a central part of the JET graphite limiter, 12:17435 (R;DE)
Magnetic Field Configurations
Broadband magnetic and density fluctuations in the TCA tokamak, 12:17412 (R;CH)
Plasma Density
Broadband magnetic and density fluctuations in the TCA tokamak, 12:17412 (R;CH)
Plasma Diagnostics
Plasma diagnostics: Detection of laser scattering: Final report, September 1, 1978 to August 31, 1982, 12:17400 (R;US)
Plasma Macroinstabilities
Magnetic reconnection in tokamaks, 12:17402 (RA;CS)
TOKAMAK FUSION CORE EXPERIMENT
See TFCX REACTORS
TOKAMAK FUSION TEST REACTOR
See TFTR TOKAMAK
TOKAMAK TYPE REACTORS
See also COMPACT IGNITION TOKAMAK
INTOR TOKAMAK
JET TOKAMAK
NET TOKAMAK
STARFIRE TOKAMAK
TFCX REACTORS
TFTR TOKAMAK
After-Heat Removal
Passive decay heat removal in liquid-metal cooled reactors, 12:17548 (J;US)
Breeding Blankets
Fusion blanket inherent safety assessment, 12:17547 (J;US)
In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Steady-state and transient thermal hydraulics of a breeder-in-tube blanket design, 12:17603 (J;US)
Thin blanket designs for the Elongated Tokamak Commercial Reactor, 12:17515 (J;US)
Uncertainties in liquid metal fusion blanket design windows, 12:17519 (J;US)
Design
Advanced tokamak reactors based on the spherical torus (ATR/ST), 12:17502 (J;US)
An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
TIBER II-An upgraded tokamak ignition/burn experimental reactor, 12:17499 (J;US)
Economic Analysis
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
ECR Heating
Free electron masers for tokamak applications, 12:17542 (J;US)
Engineering
Advanced tokamak reactors based on the spherical torus (ATR/ST), 12:17502 (J;US)
Tokamak power systems studies at ANL, 12:17496 (J;US)
Equipment Interfaces
An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
First Wall
Lithium-cooled blankets for advanced tokamaks, 12:17520 (J;US)
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Impurities
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Joule Heating
Super high field ohmically heated tokamak operation, 12:17543 (J;US)
Limiters
Experimental modelling of eddy currents and deflection for tokamak limiters, 12:17584 (J;US)
Pump limiter experiments and engineering, 12:17577 (J;US)
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Loss of Flow
Passive decay heat removal in liquid-metal cooled reactors, 12:17548 (J;US)
MHD Generators
In-situ MHD energy conversion for fusion, 12:17554 (J;US)
Modifications
TIBER II-An upgraded tokamak ignition/burn experimental reactor, 12:17499 (J;US)
Performance
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
Plasma Disruption
Experimental modelling of eddy currents and deflection for tokamak limiters, 12:17584 (J;US)
Reactor Components
An assessment of multiplexed deployment of advanced commercial tokamaks, 12:17504 (J;US)
Research Programs
Tokamak power systems studies at ANL, 12:17496 (J;US)
Shields
Measurements of reactor-relevant electromagnetic effects with the FELIX facility, 12:17528 (J;US)
Thermonuclear Fuels
An evaluation of polarized fuels in a commercial deuterium/tritium tokamak reactor, 12:17539 (J;US)
Thermonuclear Ignition
Super high field ohmically heated tokamak operation, 12:17543 (J;US)
TIBER II-An upgraded tokamak ignition/burn experimental reactor, 12:17499 (J;US)
TOLUENE
Density
Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86, 12:15302 (R;US)
Viscosity
Viscosity of synfuel compounds and mixtures: Fifth quarterly progress report, 10/1/86-12/31/86, 12:15302 (R;US)
TOMATOES
Filtration
Hyperfiltration of tomato juice: pilot plant scale high temperature testing, 12:16853 (J;US)
Hyperfiltration of tomato juice during long term high temperature testing, 12:16854 (J;US)
TOMOGRAPHY
Computerized microtomography using synchrotron radiation from the NSLS [National Synchrotron Light Source], 12:16595 (R;US)
TORI
See also COMPACT TORUS
Maintenance
Automatic path-planning for a multilink articulated boom within the torus of a fusion reactor, 12:17438 (R;DE)
Manipulators
Automatic path-planning for a multilink articulated boom within the torus of a fusion reactor, 12:17438 (R;DE)

TOTAL CROSS SECTIONS
Data Covariances
The evaluation and application of redundant-cross-section covariances, 12:17202 (R;US)
TOTAL-ABSORPTION SPECTROMETERS
See SHOWER COUNTERS
TOWER FOCUS POWER PLANTS
See also BARSTOW SOLAR PILOT PLANT
Demonstration Plants
Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report, 12:15618 (R;DE;In German)
Demonstration Programs
Technology program 'Gas-cooled Solar Tower Plant' (GAST) - analysis of the potential. Final report, 12:15618 (R;DE;In German)
Efficiency
Measurement of radiation intensity at the solar tower plant SSPS/CRS of the IEA in Spain, 12:15621 (TG;FR)
TOXIC MATERIALS
Air Pollution
Locating and estimating air emissions from sources of ethylene oxide, 12:16724 (R;US)
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Genetic Effects
Environmental biomonitoring with feral rodent species (Peromyscus leucopus), 12:16900 (RA;US)
Organic Compounds
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
Sampling
Report on the parallel ambient sampling project for selected organic toxics. Final report, 12:16722 (R;US)
TRACE ELEMENTS
See ELEMENTS
TRACKS
See PARTICLE TRACKS
TRAINING REACTORS
See also BUDAPEST TRAINING REACTOR
LFR REACTOR
SUR-100 SERIES REACTOR
UCBRR REACTOR
Program Management
Revitalization of reactor usage through reactor sharing, 12:15999 (J;US)
TRANSFER (HEAT)
See HEAT TRANSFER
TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION
TRANSFORMATIONS (ONCOGENIC)
See ONCOGENIC TRANSFORMATIONS
TRANSIENT REACTOR TEST FACILITY
See TREAT REACTOR
TRANSIENT SPECIES
See REACTION INTERMEDIATES
TRANSIENTS
Heat Transfer
Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)
Hydraulics
Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)
R Codes
Oyster Creek RETRAN model benchmark to pressure and level perturbation tests, 12:16132 (J;US)
TRANSITION ELEMENTS
See also CHROMIUM
COBALT
COPPER
GOLD
IRON
MANGANESE
MOLYBDENUM
NICKEL
NIOBIUM
SCANDIUM
SILVER
TANTALUM
TITANIUM
TUNGSTEN
VANADIUM
ZIRCONIUM
Chemical Reactions
Gas-phase chemical reactions of transition metal clusters with simple molecules, 12:16401 (R;US)
TRANSITION METALS
See TRANSITION ELEMENTS
TRANSMISSION (HEAT)
See HEAT TRANSFER
TRANSPORT (CHARGED-PARTICLE)
See CHARGED-PARTICLE TRANSPORT
TRANSPORT (NEUTRON)
See NEUTRON TRANSPORT
TRANSPORT (RADIATION)
See RADIATION TRANSPORT
TRANSPORT THEORY
See also NEUTRON TRANSPORT THEORY
Asymptotic solution of transport equation with an arbitrary indicatrix, 12:17313 (RA;SU;In Russian)
TRANSPORTATION SECTOR
Electric Power
Roles for electricity in transportation, 12:16209 (R;US)
Energy Conservation
Energy savings in transportation: An overview, 12:16215 (BA;US)
TRANSURANIUM COMPOUNDS
See also PLUTONIUM COMPOUNDS
Quantitative Chemical Analysis
Measurements of transuranium trace amounts in solution. Bibliographic study, 12:16387 (R;FR;In French)
Radioactive Waste Disposal
Proposed classification scheme for high-level and other radioactive wastes, 12:15458 (J;US)
Transuranic waste disposal in the United State, 12:15454 (J;US)
Radioactive Waste Processing
Demonstration of a remotely operated TRU waste size-reduction and material handling process, 12:15484 (J;US)
Radionuclide Migration
Measurements of transuranium trace amounts in solution. Bibliographic study, 12:16387 (R;FR;In French)
TRANSURANIUM WASTES
See ALPHA-BEARING WASTES
TREAT REACTOR
Materials Testing
Posttest examination results of recent treat tests on metal fuel, 12:15978 (R;US)
TREE RINGS
Isotope Dating
Ancient carbon cycle changes derived from tree-ring ^{13}C and ^{14}C, 12:16747 (BA;US)
Interpretation of the Northern Hemispheric record of $^{13}C/^{12}C$ trends of atmospheric CO_2 in tree rings, 12:16748 (BA;US)
TREES
See also ASPENS
BEECH TREES
MAPLES
OAKS
PINES
Plant Growth
Radiodensitometric tree-ring analysis along altitudinal gradients: Some alternative procedures for detecting site, climatic, and potential CO_2 effects on tree growth, 12:16773 (R;US)
1,3,5-TRIAMINO-2,4,6-TRINITROBENZENE
See TATB
TRIAZOLES
Chemical Preparation
Preparation of 1,1'-dinitro-3,3'-azo-1,2,4-triazole, 12:16418 (P;US)
TRIBOLOGY
Research Programs
Activities report in space tribology. Progress report, 1985, 12:16436 (R;GB)
TRIGA TYPE REACTORS
See also TRIGA-VETERANS REACTOR
UCBRR REACTOR

Decontamination
Northrop Triga facility decommissioning plan versus actual results, 12:16066 (J;US)
Low-Level Radioactive Wastes
Northrop Triga facility decommissioning plan versus actual results, 12:16066 (J;US)
Reactor Dismantling
Northrop Triga facility decommissioning plan versus actual results, 12:16066 (J;US)
TRIGA-VETERANS REACTOR
Specifications
Applications of a low power nuclear reactor, 12:15994 (RA;XA)
Uses
Applications of a low power nuclear reactor, 12:15994 (RA;XA)
TRIPLET PARTICLES
See QUARKS
TRIPLETS
Absorption Spectra
Photophysical studies of triplet exciton processes in pure polymer films: Technical progress report for the period February 1985-July 26, 1986, 12:16402 (R;US)
TRITIATED COMPOUNDS
See TRITIUM COMPOUNDS
TRITIATED WATER
See TRITIUM OXIDES
TRITIUM
Atmospheric Precipitations
Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)
Breeding
A comparative study of tritium breeding calculations using JEF-1 and ENDF/B-V based nuclear data libraries, 12:17540 (J;US)
Conceptual design of a self-cooled FLIBE blanket, 12:17514 (J;US)
Neutronics analysis for aqueous self-cooled fusion reactor blankets, 12:17594 (J;US)
Diffusion
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Earth Atmosphere
Tritium detection in installations and in environment, 12:17425 (R;FR;In French)
Inventories
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Processing
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Production
Analyses and intercomparison for Phase I Fusion Integral Experiments at the FNS Facility, 12:17509 (J;US)
Summary of recent results from the JAERI/U.S. Fusion Neutronics Phase I Experiments, 12:17508 (J;US)
Qualitative Chemical Analysis
Tritium assay of Li/sub 2/O in the LBM/LOTUS experiments, 12:17527 (J;US)
Radiation Detection
Tritium detection in installations and in environment, 12:17425 (R;FR;In French)
Radiation Monitoring
Tritium detection in installations and in environment, 12:17425 (R;FR;In French)
Radioactive Waste Processing
Tritium management in PWR fuel reprocessing plants, 12:15410 (R;FR;In French)
Radioecological Concentration
Inhomogeneous distribution of tracers in the abyssal southern ocean, 12:16792 (J;US)
Recycling
The tritium system for a tokamak with a self-pumped limiter, 12:17611 (J;US)
Research Programs
Technical requirements of experiments and facilities for fusion nuclear technology, 12:17529 (J;US)
Surface Waters
Tritium content of precipitation and surface water in Austria in 1985, 12:16791 (R;AT;In German)
TRITIUM COMPOUNDS
See also TRITIUM OXIDES
Desorption
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Physical Radiation Effects
Contamination of aluminum and painted surfaces exposed to tritium, 12:17551 (J;US)
Tracer Techniques
Flow-cytometric analysis of plateau-phase mammalian cell populations, 12:16799 (RA;US)
TRITIUM OXIDES
Adsorption
Residual tritiated water in molecular sieves, 12:17545 (J;US)
Molecular Sieves
Residual tritiated water in molecular sieves, 12:17545 (J;US)
Tritium Recovery
Water detritiation for present and future fusion plants, 12:17613 (J;US)
TRITIUM RECOVERY
In thermonuclear reactors and/or devices.
A process to recover tritium from high pressure helium, 12:17612 (J;US)
Research Programs
Water detritiation for present and future fusion plants, 12:17613 (J;US)
TRITIUM SYSTEMS TEST ASSEMBLY
Data Base Management
Data base for failure/maintenance at the Tritium Systems Test Assembly, 12:17614 (J;US)
Failures
Data base for failure/maintenance at the Tritium Systems Test Assembly, 12:17614 (J;US)
Maintenance
Data base for failure/maintenance at the Tritium Systems Test Assembly, 12:17614 (J;US)
Reviews
Tritium technology studies at the Tritium Systems Test Assembly, 12:17544 (J;US)
TRITIUM TARGET
Muon Reactions
Recent results of μCF experiments at SIN [Swiss Institute For Nuclear Research], 12:17207 (R;US)
TRIUMF CYCLOTRON
Research Programs
Review of results from TRIUMF, 12:17120 (R;CA)
TRI-UNIVERSITY MESON FACILITY
See TRIUMF CYCLOTRON
TROPOSPHERE
Ambient Temperature
Detection of changes in the global troposphere temperature field induced by greenhouse gases, 12:16734 (J;US)
Seasonal tropospheric and stratospheric temperature anomalies for the Northern Hemisphere, 1958-1983, 12:16691 (R;US)
TRU WASTES
See ALPHA-BEARING WASTES
TRX-1
See REVERSE-FIELD PINCH
TSTA
See TRITIUM SYSTEMS TEST ASSEMBLY
TSUKUBA KEK SYNCHROTRON
See KEK SYNCHROTRON
TUBES
For objects of tubular shape; not for DRIFT TUBES, ELECTRON TUBES or IMAGE STORAGE TUBES.
Materials Testing
Materials compatibility during the chlorination of molten $CaCl_2$. CaO salts, 12:16282 (R;US)
TUBES (CONDUITS)
See PIPES

TUFF
Rock-Fluid Interactions
Reference waste package environment report (NNWSI project), 12:15451 (R;US)
TUMORS
See NEOPLASMS
TUNGSTEN
Crystal Defects
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Physical Radiation Effects
Dynamic processes when irradiating of solids, 12:17348 (R;SU;In Russian)
Vacancies
PAS determination of the vacancy formation enthalpy in tungsten, 12:16310 (BA;US)
Vacancy migration enthalpy in tungsten at high temperatures, 12:16252 (R;US)
TUNGSTEN ALLOYS
Energy Spectra
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
Reflectivity
Performance of multilayer dispersion elements from 80 to 500 eV, 12:16324 (BA;US)
TUNGSTEN SELENIDES
Chemical Preparation
Reversible and irreversible redox series as probes of fundamental aspects of charge transfer across InP, WSe_2, and SnS_2/acetonitrile interfaces: Progress report, May 15, 1986-May 14, 1987, 12:16423 (R;US)
TURBINE BLADES
Dynamic Loads
Structural dynamics considerations in wind turbine rotor design, 12:15653 (BA;US)
Failures
Detection of turbomachine blading problems using on and off-line monitoring, 12:15689 (RA;US)
Protective Coatings
Thermal barrier coating life prediction model development. Annual report, 12:16332 (R;US)
Resonance
Update on an acoustic doppler technique for detecting resonant turbine blades, 12:15708 (RA;US)
TURBINES
See also STEAM TURBINES
WIND TURBINES
R Codes
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
Reliability
Equipment and procedural modifications to improve the reliability of Terry turbines used in nuclear service, 12:15785 (J;US)
Transients
Effect of pressurizer sizing on the turbine trip transient, 12:16064 (J;US)
TURBOGENERATORS
Cracks
Eddy current on-line monitoring for crack detection, 12:15706 (RA;US)
Diagnostic Techniques
On-line diagnosis of turbine-generators using artificial intelligence, 12:15696 (RA;US)
Failures
Current developments in diagnostic monitoring, 12:15681 (RA;US)
On-line diagnosis of turbine-generators using artificial intelligence, 12:15696 (RA;US)
Mechanical Vibrations
Nuclear power station predictive on condition analysis program for rotating machinery, 12:15944 (RA;US)
On-line vibration monitoring at the United Illuminating Company, 12:15691 (RA;US)
Periodic vibration monitoring at Georgia Power Company, 12:15682 (RA;US)
Rotating equipment vibration monitoring and diagnosis experience at CANDU nuclear power plants, 12:15838 (RA;US)
San Diego Gas & Electric's vibration monitoring/reduction program, 12:15685 (RA;US)
Start-up support and trouble shooting for multi-bearing machine, 12:15686 (RA;US)
Turbine supervisory instrumentation, 12:15692 (RA;US)
Vibration signature analysis at Philadelphia Electric, 12:15690 (RA;US)
TURBULENT FLOW
Fuel Element Clusters
Velocity and turbulence distributions in wall subchannels of a rod bundle with a spacer grid, 12:16475 (R;DE;In German)
Mathematical Models
Simulations of turbulent mixing and reacting flows and their applications to turbulence modeling. Semiannual progress report, 12:16433 (R;US)
TURKEY
Nuclear Power
Cost and financing of nuclear power program in Turkey, 12:15903 (RA;XA)
TVA
See TENNESSEE VALLEY AUTHORITY
TWO-BODY PROBLEM
Matrices
Study of the P-matrix structure using a potential description of two-particle interaction, 12:17371 (R;SU)
TWO-PHASE FLOW
Flow Visualization
Two-phase flow demonstration device, 12:16482 (J;US)
Mathematical Models
Correlation technique for single- and two-phase pump data, 12:15953 (J;US)

U

UCBRR REACTOR
Computerized Simulation
Simulation of the Berkeley research reactor using DSNP, 12:15998 (J;US)
U-GAS PROCESS
Chemical Reactors
The U-GAS process for producing gas from coal, 12:15275 (R;US)
Pilot Plants
The U-GAS process for producing gas from coal, 12:15275 (R;US)
Raw Materials
The U-GAS process for producing gas from coal, 12:15275 (R;US)
UHF RADIATION (01-100 GHZ)
See RADIOWAVE RADIATION
UHF RADIATION (100-1000 MHZ)
See RADIOWAVE RADIATION
UHF RADIATION (LOWER RANGE)
See RADIOWAVE RADIATION
UHF RADIATION (UPPER RANGE)
See RADIOWAVE RADIATION
UJM
See JET MODEL
UK ATOMIC ENERGY AGENCY
See UKAEA
UKAEA
Financing
Atomic Energy Authority Act 1986, 12:17682 (R;GB)
Hot Cells
Update on active facilities at Harwell, UK, 12:16460 (J;US)

ULTRACOLD NEUTRONS
Spin Orientation
Measuring module of an apparatus for polarization analysis of ultracold neutrons on the base of microcomputer, 12:16639 (R;SU;In Russian)
ULTRAHIGH FREQUENCY RADIATION (01-100 GHZ
See RADIOWAVE RADIATION
ULTRAHIGH FREQUENCY RADIATION (100-1000 M
See RADIOWAVE RADIATION
ULTRAHIGH FREQUENCY RADIATION (LOWER RANG
See RADIOWAVE RADIATION
ULTRAHIGH FREQUENCY RADIATION (UPPER RANG
See RADIOWAVE RADIATION
ULTRASONIC WAVES
Scattering Amplitudes
Characterization of flaws using the zeroes of the real and imaginary parts of the ultrasonic scattering amplitude, 12:16485 (J;US)
ULTRASONICS
See ULTRASONIC WAVES
UNCORRELATED-JET MODEL
See JET MODEL
UNDERGROUND DISPOSAL
Bench-Scale Experiments
Report of the symposium on 'total research on long life radioactive waste management' in the Research Center for Nuclear Science and Technology, Univ. of Tokyo, 12:15452 (R;JP;In Japanese)
Heat Transfer
Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
Moisture
Monitoring of heat and moisture migration from radioactive waste disposed in an augered shaft, 12:15418 (R;US)
Radionuclide Migration
Report of the symposium on 'total research on long life radioactive waste management' in the Research Center for Nuclear Science and Technology, Univ. of Tokyo, 12:15452 (R;JP;In Japanese)
UNDERGROUND EXPLOSIONS
Cavities
Modeling of buried explosions, 12:16678 (R;US)
Seismic Waves
Inversion for source parameters of underground nuclear explosions with implications for yield estimation. Technical report, 5 September 1985-5 March 1986, 12:16681 (R;US)
UNDERGROUND FACILITIES
See also WIPP
Liquid Scintillation Detectors
Non-accelerator particle physics: Progress report for period February 1, 1986-January 31, 1987, 12:17100 (R;US)
UNDERGROUND MINING
See also LONGWALL MINING
Ground Subsidence
Regulation of surface subsidence in West Virginia, 12:15346 (BA;US)
Mine Roadways
Numerical modelling of development roadways, German Creek Central Colliery, Central Queensland, 12:15320 (R;AU)
Mining Equipment
Surface and underground coal-mine-equipment population, 1982. Information Circular/1986, 12:15322 (R;US)
UNDERGROUND STORAGE
Temperature Control
Prediction of temperatures in underground storage facilities for heat-generating materials at the Idaho Chemical Processing Plant, 12:15472 (J;US)
UNIFIED GAUGE MODELS
See also GRAND UNIFIED THEORY
STANDARD MODEL
Scalar Fields
Scalar sector of gauge theories and the quest for a unified theory, 12:17186 (BA;NL)
UNION OF SOVIET SOCIALIST REPUBLICS
See USSR
UNITED KINGDOM
Energy Conservation
Consumer energy conservation policies and programmes in Britain, 12:16166 (R;DE)
Energy Policy
Consumer energy conservation policies and programmes in Britain, 12:16166 (R;DE)
Fossil-Fuel Power Plants
Fossil plant water chemistry - C.E.G.B. approach and experience, 12:15727 (RA;US)
Geothermal Resources
Further investigations of the UK heat flow field (1981-1984). Investigation of the geothermal potential of the UK, 12:15628 (R;GB)
Heat flow and regional groundwater flow in the United Kingdom. Investigation of the geothermal potential of the UK, 12:15626 (R;GB)
Heat Flow
Heat flow and regional groundwater flow in the United Kingdom. Investigation of the geothermal potential of the UK, 12:15626 (R;GB)
Intergovernmental Cooperation
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
Technology Transfer
Treaty Series No. 60 (1985) - Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the People's Republic of China for Co-operation in the Peaceful Uses of Nuclear Energy with exchange of letters - London, 3 June 1985, 12:17683 (R;GB)
UNITED STATES OF AMERICA
See USA
UNIVERSE
Cosmological Models
Supersymmetric inflation: Recent progress, 12:17390 (BA;US)
The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
The new inflationary universe, 1984, 12:17389 (BA;US)
Mass Distribution
Inflation in a wall dominated universe, 12:17392 (BA;US)
The behavior of the Higgs field in the new inflationary universe, 12:17391 (BA;US)
The new inflationary universe, 1984, 12:17389 (BA;US)
Thermodynamics
Thermodynamics of the Universe, 12:16955 (RA;CS)
UNIVERSITY OF CALIFORNIA BERKELEY REACTOR
See UCBRR REACTOR
UNIVERSITY OF TORONTO SLOWPOKE REACTOR
See SLOWPOKE-TORONTO REACTOR
URANIUM
Charges
Nuclear investment and fuel cycle costs. Short and long term evolution of uranium costs. Canadian perspective, 12:15406 (RA;XA)
Electrorefining
The application of electrorefining for recovery and purification of fuel discharged from the Integral Fast Reactor, 12:15383 (R;US)
Photometry
Technology transfer of kinetic phosphorimetry, 12:16392 (RA;US)
Production
Nuclear investment and fuel cycle costs. Short and long term evolution of uranium costs. Canadian perspective, 12:15406 (RA;XA)
Radionuclide Migration
Environmental protection support and assistance, 12:15443 (RA;US)
Solubility
Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine, 12:15447 (R;US)

Evaluation of Synroc-C as a second generation waste form, 12:15446 (R;US)
URANIUM 232
Retention
Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{233}UO_2(NO_3)_2$ in the rat, 12:16881 (J;US)
Tissue Distribution
Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{233}UO_2(NO_3)_2$ in the rat, 12:16881 (J;US)
URANIUM 233
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Retention
Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{233}UO_2(NO_3)_2$ in the rat, 12:16881 (J;US)
Tissue Distribution
Deposition and early disposition of inhaled $^{233}UO_2(NO_3)_2$ and $^{233}UO_2(NO_3)_2$ in the rat, 12:16881 (J;US)
URANIUM 234
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
Metabolism
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
Prenatal Exposure
Placental transfer of the actinides and related heavy elements, 12:16878 (R;US)
URANIUM 234 TARGET
Neutron Reactions
Chemical shifts of uranium neutron resonances, 12:17251 (RA;CS)
Energy dependence peculiarities of fragment mean kinetic energy at nuclei fission by neutrons, 12:17248 (RA;CS)
URANIUM 235
Gamma Spectroscopy
^{235}Uranium isotope abundance certified reference material for gamma spectrometry EC nuclear reference material 171 certification report, 12:16389 (R;FR)
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
URANIUM 235 TARGET
Neutron Reactions
/sup 235/U(n,f) fragment mass, kinetic energy and angular distributions at energies below 6 MeV - results and interpretation, 12:17246 (RA;CS)
Chemical shifts of uranium neutron resonances, 12:17251 (RA;CS)
Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)
Experimental study of γ-ray emission from neutron resonance fission of /sup 235/U, 12:17250 (RA;CS)
Uncertainties in scientific measurements, 12:17216 (R;US)
URANIUM 236
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
URANIUM 238
Mass Spectroscopy
Sequential mass spectrometric analysis of uranium and plutonium employing resin bead technique, 12:16375 (R;IN)
URANIUM 238 TARGET
Calcium 48 Reactions
Competition between fusion and quasi-fission in heavy ion induced reactions, 12:17242 (R;US)
Neutron Reactions
Chemical shifts of uranium neutron resonances, 12:17251 (RA;CS)
Energy dependence of the neutron multiplicity P/sub nu/ in fast neutron induced fission of /sup 235,238/U and ^{239}Pu, 12:17239 (R;US)
Setup for determination of elastic and inelastic scattered neutron angular distribution by means of neutron filters, 12:17252 (R;SU;In Russian)
URANIUM ALLOYS
See also URANIUM BASE ALLOYS
Magnetic Properties
Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
Phase Studies
Phases in U-Si alloys, 12:16256 (R;US)
Physical Radiation Effects
Crystal structure stability and fission gas swelling in intermetallic uranium compounds, 12:16301 (J;NL)
Superconductivity
Normal state magnetic behavior of (U/sub 1-x/RE/sub x/)Be_{13} pseudobinaries, 12:16284 (R;US)
URANIUM BASE ALLOYS
Ductility
Ductility of materials under dynamic solicitations, 12:16243 (R;FR;In French and English)
URANIUM DIOXIDE
Compression Strength
On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Computerized Simulation
On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Corrosion Resistance
In-pile and out-of-pile corrosion behavior of thoria-urania pellets (LWBR [Light Water Breeder Reactor] Development program), 12:15857 (R;US)
Crystal Structure
On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Fission Product Release
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
Fracture Properties
On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Fuel Rods
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
Hardness
On the correlation between fuel structure and mechanical properties of UO/sub 2/, 12:15378 (BA;US)
Leaching
Comparison of uranium release from spent fuel and unirradiated UO_2 in salt brine, 12:15447 (R;US)
Nuclear Fuels
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Solid Solutions
O/M ratio measurements of $(U,Gd)O_2$ solid solutions by gravimetry, 12:15814 (J;US)
URANIUM HEXAFLUORIDE
Dissociation
Multiphoton dissociation of UF6 at lambda = 16 μm in supersonic jets, 12:16400 (R;FR)
Road Transport
Validation study of the intertran model for assessing risks of transportation accidents: Road transport of uranium hexafluoride, 12:15489 (R;FR)
URANIUM II
See URANIUM 234
URANIUM MILLS
See FEED MATERIALS PLANTS
URANIUM NITRATES
Radioactive Waste Processing
Operation of a radiochemical uranium nitrate solidification facility, 12:15485 (J;US)
URANIUM NITRIDES
Quantitative Chemical Analysis
Semi-microdetermination of nitrogen in actinide compounds by Dumas method, 12:16376 (R;IN)

URANIUM OXIDES
See also URANIUM DIOXIDE
Computerized Simulation
Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
Fission Product Release
Prediction of the UO/sub 2/ fission gas release data of Bellamy and Rich using a model recently developed by Combustion Engineering, 12:15971 (BA;US)
URANIUM SILICIDES
Phase Studies
Phases in U-Si alloys, 12:16256 (R;US)
URANIUM X 1
See THORIUM 234
URANUS PLANET
Acetylene
Spectroscopic observations of the planets, 12:16986 (RA;US)
Albedo
Planetary optical and infrared imaging, 12:17022 (RA;US)
Visible phase curves of Uranus and Neptune and scattering in their atmospheres, 12:16993 (RA;US)
Brightness
Lunar and planetary studies, 12:16984 (RA;US)
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Deuterium Compounds
Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Spectroscopic observations of the planets, 12:16986 (RA;US)
Eclipse
Portable high speed photometry systems for observing occultations, 12:16974 (RA;US)
Heat Sources
Visible phase curves of Uranus and Neptune and scattering in their atmospheres, 12:16993 (RA;US)
Hydrogen
Ground-based studies of Jupiter, Uranus, and Neptune in support of the Galileo and Voyager missions, 12:16989 (RA;US)
Methane
Infrared observations of planetary atmospheres, 12:16985 (RA;US)
Outer planet studies, 12:16981 (RA;US)
Microwave Spectra
Submillimeter and millimeter observations of solar system objects, 12:16983 (RA;US)
Nebulae
Planetary Fabry-Perot spectroscopy, 12:16992 (RA;US)
Planetary Atmospheres
Portable high speed photometry systems for observing occultations, 12:16974 (RA;US)
URANYL COMPLEXES
Molecular Structure
Synthesis and structure of $[(UO_2)_6(N_3)_{16}O_2]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$, 12:16428 (R;FR)
Synthesis
Synthesis and structure of $[(UO_2)_6(N_3)_{16}O_2]8^+$ $[(CH_3)_4N]8^+$, $2H_2O$, 12:16428 (R;FR)
URBAN AREAS
Mass Transit Systems
National urban mass transportation statistics. 1983 Section 15 annual report. Transit financial and operating data reported for years ending between January 1, 1983 and December 31, 1983, 12:16210 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Annual report, 12:16211 (R;US)
National urban mass transportation statistics. 1981 Section 15 report. Transit financial and operating data reported for fiscal year ending between July 1, 1980 and June 30, 1981. Supplement, 12:16212 (R;US)
National urban mass transportation statistics. Second annual report. Section 15 reporting system. Transit financial and operating data reported for fiscal year ending between July 1, 1979 and June 30, 1980, 12:16213 (R;US)
National urban mass transportation statistics. 1982 Section 15 annual report. Transit financial and operating data reported for fiscal year ending between July 1, 1981 and June 30, 1982, 12:16214 (R;US)
US DOE
See also ANL
BATTELLE PACIFIC NORTHWEST LABORATORIES
BNL
HANFORD RESERVATION
IDAHO CHEMICAL PROCESSING PLANT
IDAHO NATIONAL ENGINEERING LABORATORY
LASL
OAK RIDGE RESERVATION
ORGDP
ORNL
SANDIA LABORATORIES
SAVANNAH RIVER PLANT
WIPP
Competition
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)
Contract Management
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)
Cooperation
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Planning
Cooperative R and D ventures: An opportunity for leveraged research in fossil energy, 12:15266 (R;US)
Procurement
Annual report to Congress on competition, FY 1986, 12:17634 (R;US)
US NRC
United States Nuclear Regulatory Commission-prior to 1975 was part of US AEC.
Regulations
Smart approach to level-1 probabilistic risk assessment, 12:16080 (J;US)
USA
See also FEDERAL REGION I
Air Quality
Air quality data - 1985 annual statistics including summaries with reference to standards. Annual report, 12:16712 (R;US)
Ambient Temperature
Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
Atmospheric Precipitations
Climatic data for selected US and Canadian stations 1941-1980, 12:16695 (R;US)
BWR Type Reactors
Electric Power Research Institute (EPRI) study on small and medium power reactor concepts having present potential for the USA, 12:15875 (RA;XA)
Fossil-Fuel Power Plants
A study on the systematic control of CO/sub 2/ emissions from fossil-fuel power plants in the U.S., 12:16730 (J;US)
PWR Type Reactors
Electric Power Research Institute (EPRI) study on small and medium power reactor concepts having present potential for the USA, 12:15875 (RA;XA)
Thermonuclear Power Plants
Fusion power: One answer to U.S. energy needs in the 21st century, 12:17625 (BA;US)
Wind Power
Wind energy technology research in the U.S., 12:15660 (BA;US)
USSR
WWER Type Reactors
Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)
UTAH
Geothermal Resources
Low-temperature geothermal assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah, 12:15625 (R;US)

Oil Shale Deposits
Assay products from Green River oil shale, 12:15373 (R;US)
UTERINE CERVIX CARCINOMA
See CARCINOMAS
UTILITIES
See ELECTRIC UTILITIES

V

V-2 REACTOR (DUKOVANY)
See DUKOVANY V-2 REACTOR
VACUUM SYSTEMS
Composite Materials
First wall tile attachment using carbon-carbon composite fittings, 12:17582 (J;US)
Design
First wall and vacuum vessel analysis for Compact Ignition Tokamaks, 12:17507 (J;US)
VALENCE ELECTRONS
See ELECTRONS
VALVES
See also RELIEF VALVES
Materials Testing
Evaluation of advanced materials for severe slurry erosion service: Final report, 12:15290 (R;US)
Monitoring
BWR control rod drive scram pilot valve monitoring program, 12:15767 (RA;US)
Operation
Motor-operated valve operability verification and trending from the motor control center, 12:15952 (J;US)
Testing
Motor-operated valve operability verification and trending from the motor control center, 12:15952 (J;US)
VANADIUM
Ecological Concentration
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
VANADIUM 51
Dimensions
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
Spectral Shift
Nuclear charge distribution in 1integral/sub 7/2/-shell nuclei from muonic x-ray measurements, 12:17222 (J;US)
VANADIUM ALLOYS
See also VANADIUM BASE ALLOYS
Corrosion Products
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Corrosion Resistance
Fundamental corrosion characterization of high-strength titanium alloys, 12:16320 (BA;US)
Physical Radiation Effects
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
FLiBe-vanadium alloy system corrosion product radiation hazards analysis, 12:17576 (J;US)
Temperature Effects
First wall structural analysis of the aqueous self-cooled blanket concept, 12:17600 (J;US)
VANADIUM BASE ALLOYS
See also VANSTAR 7
Physical Radiation Effects
Detection of near-surface ^{53}Cr segregation in irradiated ^{51}V(Cr) by RBS [Rutherford Backscattering Spectrometry] (Rutherford backscattering spectrometry; V-15%Cr), 12:16257 (R;US)
VANSTAR 7
Fatigue
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)
Strains
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)
Temperature Effects
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 12:17583 (J;US)
VARIABLE ENERGY CYCLOTRONS
RF Systems
RF-phase measurement and optimization for the Variable Energy Cyclotron, Calcutta, 12:16520 (R;IN)
VARIABLE STARS
Brightness
UBVRI-photometry of the antiflare stars V586 Ori and IU Ori, 12:16958 (R;SU;In Russian)
VECTOR PROCESSING
Efficiency
Toward efficient implementations of PCCG (preconditioned conjugate gradient) methods on vector supercomputers. Technical report, 12:17639 (R;US)
VEGETATION
See PLANTS
VEHICLES
See also AUTOMOBILES
ELECTRIC-POWERED VEHICLES
SPACE VEHICLES
Automotive Fuels
Technology and market assessment of gas-fueled vehicles in New York State, 12:16229 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 1. Executive summary. Final report, 12:16230 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 2. Technology and economic assessment. Final report, 12:16231 (R;US)
Technology and market assessment of gas-fueled vehicles in New York State. Volume 3. Institutional barriers and market assessment. Final report, 12:16232 (R;US)
VELOCIMETERS
Lasers
A laser Doppler method for noninvasive measurement of flow velocity, 12:16478 (R;US)
An automated two-dimensional laser velocimeter system, 12:16674 (R;US)
Sound Waves
Report on the comparison of measurements between two monostatic Doppler-SODAR's manufactured by REMTECH, 12:16686 (R;DE;In German)
VENTILATION BARRIERS
Design
Field evaluation of windscreens as a fugitive dust control measure for materials storage piles, 12:16704 (RA;US)
Performance Testing
Field evaluation of windscreens as a fugitive dust control measure for materials storage piles, 12:16704 (RA;US)
VENUS PLANET
Planetary Atmospheres
Upper atmosphere of Venus: a tentative explanation of its rotation, 12:17054 (TJ;US)
Wind
Advanced infrared astronomy, 12:16971 (RA;US)
VENUS REACTOR
Reactor Kinetics
Neutron and gamma-ray flux calculations for the VENUS PWR engineering mockup, 12:15826 (J;US)
VERSENE
See EDTA
VERTICAL AXIS TURBINES
Capitalized Cost
The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)
Design
The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)

Operating Cost
The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)
Performance Testing
The Taylor 'V' Type Vertical Axis Wind Turbine: Current status, 12:15665 (BA;US)
Research Programs
Canadian wind energy R & D, 12:15639 (BA;US)

VERY HIGH FREQUENCY RADIATION
See RADIOWAVE RADIATION

VESSELS
See CONTAINERS

VESSELS (CHEMICAL REACTIONS)
See CHEMICAL REACTORS

VESSELS (PRESSURE)
See PRESSURE VESSELS

VETERANS ADMINISTRATION HOSPITAL TRIGA RE
See TRIGA-VETERANS REACTOR

VHF RADIATION
See RADIOWAVE RADIATION

VIBRATIONS (MECHANICAL)
See MECHANICAL VIBRATIONS

VINOFLEX
See POLYVINYLS

VINYL CHLORIDE
Air Pollution
Vinyl chloride standards: responses to comments on January 1985 proposed revisions, 12:16771 (R;US)

VINYLBENZENE
See STYRENE

VISIBLE RADIATION
Biological Effects
Diel vertical movements of bacteria in intertidal streams of Sippewissett Marsh, 12:16833 (RA;US)
Sheath pigment formation in a blue-green algae lyngbya aestuarii as an adaptation to high light, 12:16832 (RA;US)

VITRINITE
See MACERALS

VOGTLE-1 REACTOR
Waynesboro, Georgia, USA
Reactor Operation
Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425), 12:16060 (R;US)
Technical specifications, Vogtle Electric Generating Plant, Unit No. 1 (Docket No. 50-424): Appendix "A" to license No. NPF-61, 12:15803 (R;US)
Reactor Safety
Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425), 12:16060 (R;US)
Specifications
Technical specifications, Vogtle Electric Generating Plant, Unit No. 1 (Docket No. 50-424): Appendix "A" to license No. NPF-61, 12:15803 (R;US)

VOGTLE-2 REACTOR
Waynesboro, Georgia, USA
Reactor Operation
Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425), 12:16060 (R;US)
Reactor Safety
Safety evaluation report related to the operation of Vogtle Electric Generating Plant, Units 1 and 2 (Docket Nos. 50-424 and 50-425), 12:16060 (R;US)

VOLCANIC GASES
Chemical Composition
Evaluation of gas data from high-temperature fumaroles at Mount St. Helens, 1980-1982, 12:16740 (J;NL)
Identification of the physical and chemical characteristics of volcanic hazards, 12:16930 (J;US)
Sampling
Identification of the physical and chemical characteristics of volcanic hazards, 12:16930 (J;US)

VOLCANOES
Volcanic Gases
Identification of the physical and chemical characteristics of volcanic hazards, 12:16930 (J;US)

VOLTAIC CELLS
See ELECTRIC BATTERIES

VULCAIN EXPERIMENT NUCLEAR STUDY
See VENUS REACTOR

W

W. B. MC GUIRE-1 REACTOR
See MC GUIRE-1 REACTOR

WAKEFIELD ACCELERATORS
Experiment Planning
The ANL experiment for a wake field accelerator using an rf structure, 12:16502 (R;US)
RF Systems
The ANL experiment for a wake field accelerator using an rf structure, 12:16502 (R;US)

WALLS
Sampling
Operational experiences with a remote core-boring device, 12:16130 (J;US)

WARFARE
Robots
Evaluating telerobotics for battlefield support operations, 12:16441 (R;US)

WASTE BURIAL
See UNDERGROUND DISPOSAL

WASTE FORMS
Certification
Nuclear Waste Treatment Program: Qualification of commercial high-level waste forms: Approach and status, 12:15445 (R;US)
Leaching
Long-term leaching behavior of simulated Savannah River Plant waste glass: Part 1, MCC-1 leachability results, four-year leaching data, 12:16356 (R;US)
Release of organic chelating agents from solidified decontamination wastes, 12:15408 (R;US)
Waste glass leaching: Chemistry and kinetics, 12:15448 (R;US)
Performance
The effects of gamma radiation on groundwater chemistry and glass reaction in a saturated tuff environment, 12:15413 (R;US)
Specifications
Nuclear Waste Treatment Program: Qualification of commercial high-level waste forms: Approach and status, 12:15445 (R;US)

WASTE ISOLATION PILOT PLANT
See WIPP

WASTE MANAGEMENT
See also RADIOACTIVE WASTE MANAGEMENT
WASTE PROCESSING
WASTE TRANSPORTATION
Evaluation
Hazardous-waste management: a descriptive study. Master's thesis, 12:16156 (R;US)

WASTE OILS
Waste Disposal
Evaluation of potential mixed wastes containing lead, chromium, used oil, or organic liquids, 12:15439 (R;US)

WASTE PROCESSING
See also ACTIVATED SLUDGE PROCESS
RADIOACTIVE WASTE PROCESSING
Ecology
Energy from waste: Is it ecologically acceptable, 12:16488 (RA;DE;In German)
Waste Water
Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)

WASTE SOLUTIONS
See LIQUID WASTES

WASTE TRANSPORTATION
Records Management
Logbooks: A key to test/experiment data integrity, 12:15568 (BA;US)
WASTE TREATMENT
See WASTE PROCESSING
WASTE WATER
Activated Sludge Process
Low-rank coal research: Quarterly technical progress report for the period April-June 1986, 12:15310 (R;US)
Anaerobic Digestion
Recent developments in wet carbonization of peat, 12:15274 (R;US)
Recovery of methane from combined industrial and municipal wastewater by anaerobic treatment, 12:15586 (R;US)
Chemical Composition
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Emission Spectroscopy
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Water Treatment
Quality of leachate from retorted oil shale wetted with treated process waters, 12:15375 (R;US)
Water Treatment Plants
Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)
WASTEFORMS
See WASTE FORMS
WASTE-FUELED POWER PLANTS
See REFUSE-FUELED POWER PLANTS
WATER
See also DRINKING WATER
FEEDWATER
FRESH WATER
GROUND WATER
HEAVY WATER
SEAWATER
WASTE WATER
Detection
Water induction detection system: field testing, 12:15693 (RA;US)
Differential Cross Sections
Effects of phase on differential ionization cross sections, 12:17321 (RA;US)
Radiation Doses
Calibration of beta-particle ophthalmic applicators at the National Bureau of Standards, 12:17331 (R;US)
Tritium Recovery
Water detritiation for present and future fusion plants, 12:17613 (J;US)
WATER CHEMISTRY
Computer Calculations
Calculation of the carbonic acid equilibria taking into consideration complex formation of calcium and magnesium and the presence of phosphate, ammonia and boric acid, 12:16404 (R;DE;In German)
Control
Fossil plant water chemistry - C.E.G.B. approach and experience, 12:15727 (RA;US)
Measuring Methods
Chemical analysis for fossil plant water chemistry, 12:15726 (RA;US)
Monitoring
Cycle chemistry: sampling points and frequencies, presentation, and use of analytical data, 12:15725 (RA;US)
TUGCO's turbine environment index (Texas Utilities Generating Company), 12:15721 (RA;US)
Research Programs
EPRI fossil plant cycle chemistry programs, 12:15724 (RA;US)
Iron oxides in thermoelectric cycles: theoretical aspects and their possible influence on service, 12:15730 (RA;US)
Overview of RP2712-1, interim consensus guidelines on fossil plant cycle chemistry, 12:15720 (RA;US)
Water Chemistry Division Progress Report, April 1983-April 1985, 12:16399 (R;IN)
WATER CONTENT
See HUMIDITY
WATER COOLANT
See WATER
WATER COOLED GRAPHITE MODERATED REACTORS
See LWGR TYPE REACTORS
WATER COOLED REACTORS
See also BR-2 REACTOR
BWR TYPE REACTORS
LWBR TYPE REACTORS
LWGR TYPE REACTORS
PWR TYPE REACTORS
TRIGA TYPE REACTORS
VENUS REACTOR
Fuel Elements
Water reactor fuel element performance computer modelling, 12:15796 (B;US)
Fuel Rods
Effect of axial diffusional delays on the overall fission gas release, 12:15972 (BA;US)
Release of tellurium and caesium from UO/sub 2/ in LWR fuel rods during irradiation, 12:15970 (BA;US)
SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
Loss of Coolant
SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
Transients
SSYST: A code-system for analyzing transient LWR fuel rod behaviour under off-normal conditions, 12:16145 (BA;US)
WATER DISTRIBUTION
See WATER SUPPLY
WATER MODERATOR
See WATER
WATER POLLUTION
Biological Indicators
Biological markers of environmental contaminants: analysis of P450 activities and adduct formation in aquatic and terrestrial species exposed to benzo(a)pyrene (Lepomis macrochirus; Ondatra zibethica; Blarina brevicauda), 12:16892 (RA;US)
Monitoring
Design of a drinking-water-quality monitoring program, 12:16783 (R;US)
WATER SOURCE HEAT PUMPS
Coefficient of Performance
Development of advanced water-to-water heat pumps in the range of 200- to 5000-kW thermal output: prestudy, 12:16206 (R;US)
WATER SUPPLY
Used in the sense of a public utility or of an engineered system (e.g., irrigation system) as contrasted to a natural system, for which use WATER RESOURCES.
Monitoring
Design of a drinking-water-quality monitoring program, 12:16783 (R;US)
WATER TREATMENT PLANTS
Air Pollution
Preliminary assessment of air emissions from aerated waste-treatment systems at hazardous-waste-treatment storage and disposal facilities. Final report, 12:16723 (R;US)
WATER VAPOR
Differential Cross Sections
Effects of phase on differential ionization cross sections, 12:17321 (RA;US)
Theoretical single differential cross sections for bare ions, 12:17315 (RA;US)
Ionization
Theoretical single differential cross sections for bare ions, 12:17315 (RA;US)
WATERBORNE PARTICLES
See PARTICULATES
WATERFLOODING
See also CAUSTIC FLOODING
Bench-Scale Experiments
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)

Field Tests
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 45, Quarter ending December 31, 1985, 12:15353 (R;US)

WAVE ENERGY CONVERTERS
Bending
Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)
Motion
Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)

WAVE POWER
Research Programs
Long spines with appendages. A report to the Wave Energy Steering Committee covering work supported by the United Kingdom Department of Energy, 12:15631 (R;GB)

WAVEGUIDES
Electromagnetic Fields
Phase velocity of wave in irregular waveguide in problems of synthesis, 12:16523 (R;SU)
Phase Velocity
Phase velocity of wave in irregular waveguide in problems of synthesis, 12:16523 (R;SU)

WAVES (SHOCK)
See SHOCK WAVES

WAZ 16
See NICKEL BASE ALLOYS

WEAK BOSON
See INTERMEDIATE VECTOR BOSONS

WEAK INTERACTIONS
Evolution of weak interactions, 12:17097 (R;XC)

WEAR
On-Line Measurement Systems
On-line wear monitoring in liquid metal reactors, 12:15847 (R;US)

WECS
See WIND TURBINES

WEIGHT INDICATORS
Remote Handling Equipment
Remote weighing of irradiated fuel pins at FFTF, 12:15997 (J;US)

WELDED JOINTS
Fracture Properties
Stress rupture properties of austenitic steel weld metals, 12:16271 (R;FR)
Inspection
Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant, 12:15786 (J;US)
Porosity
Porosity decrease in laser welds of stainless steel using plasma control, 12:16322 (BA;US)
Quality Assurance
Development and implementation of visual weld acceptance criteria for Brunswick Steam Electric Plant, 12:15786 (J;US)
Sample Preparation
Laser welding metallography (Of ultra-small parts), 12:16299 (R;US)
Tensile Properties
Tensile properties of austenitic steel weld metals, 12:16272 (R;FR)

WELDS
See WELDED JOINTS

WELL LOGGING EQUIPMENT
To be used only when the equipment itself is the topic of the paper; includes source, detector, and associated equipment.
Calibration
Low radioactivity spectral gamma calibration facility, 12:15347 (BA;US)
Design
Evaluation and design of a large spacing loop-loop electromagnetic tool, 12:15349 (BA;US)

WEST GERMANY
See FEDERAL REPUBLIC OF GERMANY

WEST VALLEY PROCESSING PLANT
Decommissioning
Decommissioning the world's first commercial nuclear fuel reprocessing facility, 12:15558 (RA;US)
Decontamination and decommissioning of extraction cell 3 at the West Valley Demonstration Project, 12:15522 (RA;US)
Decontamination of the chemical crane room and decontamination and decommissioning of the extraction chemical room at the West Valley Demonstration Project, 12:15544 (RA;US)
Decontamination
Decontamination and decommissioning of extraction cell 3 at the West Valley Demonstration Project, 12:15522 (RA;US)
Decontamination of the chemical crane room and decontamination and decommissioning of the extraction chemical room at the West Valley Demonstration Project, 12:15544 (RA;US)
Radioactive Wastes
Radioactive waste assay at the West Valley Demonstration Project, 12:15529 (RA;US)

WEST VIRGINIA
Oil Fields
Economic evaluation of a CO/sub 2/-enhanced oil recovery flood at the Rock Creek Field, Roane County, West Virginia, 12:15360 (BA;US)
Underground Mining
Regulation of surface subsidence in West Virginia, 12:15346 (BA;US)

WESTINGHOUSE STANDARD REACTOR
Prior to 1975, PWR/41 TYPE REACTORS was used.
Reactor Kinetics
Method of baffle/reflector region homogenization, 12:15816 (J;US)
Pin Power prediction in the Westinghouse Advanced Nodal Code, 12:15815 (J;US)
Steam Generators
Evaluation of feedwater systems for reactor scram reduction, 12:15818 (J;US)
Turbulence force correlation of PWR steam generator tube bundle flow, 12:15834 (J;US)

WET-TYPE COOLING TOWERS
See COOLING TOWERS

WHITE DWARF STARS
Pulsations
Pulsations of white dwarf stars with thick hydrogen or helium surface layers, 12:16963 (R;US)

WILD ANIMALS
Management
Resource management plan for the Oak Ridge Reservation: Volume 24, Threatened and endangered animal species, 12:16782 (R;US)

WILSON LOOP
Renormalization
Infrared asymptotics of perturbative QCD. Renormalization properties of the Wilson loops in higher orders of perturbation theory, 12:17170 (R;SU)

WIND
Monitoring
A low cost and easy to reproduce anemometer for basic wind data acquisition, 12:15633 (BA;US)
Significance of upper air meteorological conditions in Altamont Pass wind resource assessment, 12:15635 (BA;US)
Wind characteristics, northwest Texas region, 12:15634 (BA;US)
Wind speed variability in the California Altamont Pass area, 12:15657 (BA;US)
Velocimeters
Report on the comparison of measurements between two monostatic Doppler-SODAR's manufactured by REMTECH, 12:16686 (R;DE;In German)

WIND ENERGY CONVERSION SYSTEMS
See WIND TURBINES

WIND FARMS
See WIND TURBINE ARRAYS

WIND GENERATORS
See ELECTRIC GENERATORS

WIND TURBINES
WIND POWER
Availability
Wind characteristics, northwest Texas region, 12:15634 (BA;US)
Feasibility Studies
The Netherlands wind energy research and development program, 12:15656 (BA;US)
Forecasting
Missing data: How does it affect the accuracy of key wind statistics, 12:15636 (BA;US)
Investment
Beyond 1985: New market development, 12:15637 (BA;US)
Market
Beyond 1985: New market development, 12:15637 (BA;US)
Meetings
Wind power 85, 12:15632 (B;US)
Research Programs
Pacific Gas and Electric Company's wind energy program results, 12:15649 (BA;US)
Statistics
Missing data: How does it affect the accuracy of key wind statistics, 12:15636 (BA;US)
Uses
Wind energy utilization status of research and development in the Federal Republic of Germany, 12:15641 (BA;US)
WIND POWER PLANTS
Operation
Integrating wind energy into the electric utility system, 12:15646 (BA;US)
WIND TURBINE ARRAYS
Commercialization
Windfarm noise issues and impacts, 12:15642 (BA;US)
Economics
Wind farm economics from a utility perspective, 12:15650 (BA;US)
Environmental Impacts
Permitting windfarms in California: Environmental impacts, local regulations, developer responsibility, 12:15643 (BA;US)
Windfarm noise issues and impacts, 12:15642 (BA;US)
Feasibility Studies
Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon, 12:15640 (BA;US)
Field Tests
Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon, 12:15640 (BA;US)
Wind park electrical testing by Southern California Edison, 12:15645 (BA;US)
Installation
Wind farm economics from a utility perspective, 12:15650 (BA;US)
Noise
Environmental noise considerations for the siting and operation of wind energy farms, 12:15644 (BA;US)
Windfarm noise issues and impacts, 12:15642 (BA;US)
Performance Testing
Pacific Gas and Electric Company's wind energy program results, 12:15649 (BA;US)
Research Programs
Progress and problems in wind energy research and development in Hawaii, 12:15647 (BA;US)
Site Selection
Environmental noise considerations for the siting and operation of wind energy farms, 12:15644 (BA;US)
Meteorological aspects of the wind farm feasibility study at Cape Blanco, Oregon, 12:15640 (BA;US)
WIND TURBINES
See also HORIZONTAL AXIS TURBINES
VERTICAL AXIS TURBINES
Alternators
Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
Computerized Control Systems
Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
Construction
Wind energy activities in Denmark, 12:15651 (BA;US)
Data Processing
A proposed method for processing data on wind energy conversion systems testing, 12:15655 (BA;US)
Design
Modal testing in the design evaluation of wind turbines, 12:15654 (BA;US)
Optimizing output of a wind-driven alternator using microprocessor control, 12:15652 (BA;US)
Preliminary report on the field testing of latest model Campbell Chinese-type windmill, 12:15662 (BA;US)
Structural dynamics considerations in wind turbine rotor design, 12:15653 (BA;US)
Wind energy activities in Denmark, 12:15651 (BA;US)
Wind energy technology research in the U.S., 12:15660 (BA;US)
Dynamic Loads
Structural dynamics considerations in wind turbine rotor design, 12:15653 (BA;US)
Efficiency
A proposed method for processing data on wind energy conversion systems testing, 12:15655 (BA;US)
Fabrication
Preliminary report on the field testing of latest model Campbell Chinese-type windmill, 12:15662 (BA;US)
Field Tests
Preliminary report on the field testing of latest model Campbell Chinese-type windmill, 12:15662 (BA;US)
Operation
Preliminary report on the field testing of latest model Campbell Chinese-type windmill, 12:15662 (BA;US)
Performance Testing
A proposed method for processing data on wind energy conversion systems testing, 12:15655 (BA;US)
Modal testing in the design evaluation of wind turbines, 12:15654 (BA;US)
Review of standards/codes of practice related to safety and reliability of wind energy conversion systems, 12:15648 (BA;US)
Reliability
Review of standards/codes of practice related to safety and reliability of wind energy conversion systems, 12:15648 (BA;US)
Research Programs
The EEC Wind Energy R&D Programme, 1985-1988, 12:15658 (BA;US)
The Italian programmes for wind energy, 12:15659 (BA;US)
The Netherlands wind energy research and development program, 12:15656 (BA;US)
Wind energy activities in Sweden, 12:15638 (BA;US)
Wind energy utilization status of research and development in the Federal Republic of Germany, 12:15641 (BA;US)
Wind energy activities in Denmark, 12:15651 (BA;US)
Safety
Review of standards/codes of practice related to safety and reliability of wind energy conversion systems, 12:15648 (BA;US)
WIPP
Interpretation of the convergent-flow tracer tests conducted in the Culebra dolomite at the H-3 and H-4 hydropads at the Waste Isolation Pilot Plant (WIPP) site, 12:15449 (R;US)
Site Characterization
1986 annual water quality data report for the Waste Isolation Pilot Plant, 12:15488 (R;US)
WIRE SPARK CHAMBERS
Readout Systems
Readout method for wire chambers, 12:16633 (R;SU;In Russian)
WISCONSIN
Geology
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project (Stockbridge-Munsee Indian Reservation land which is located in northwest portion of Shawano County, Wisconsin), 12:15421 (R;US)

Indian Reservations
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project (Stockbridge-Munsee Indian Reservation land which is located in northwest portion of Shawano County, Wisconsin), 12:15421 (R;US)
Radioactive Waste Disposal
Technical review of US Department of Energy draft area recommendation report for the crystalline repository project (Stockbridge-Munsee Indian Reservation land which is located in northwest portion of Shawano County, Wisconsin), 12:15421 (R;US)

WOLFRAM
See TUNGSTEN

WOOD ALCOHOL
See METHANOL

WOOD-FUEL POWER PLANTS
Cyclone Separators
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)
Electrostatic Precipitators
Performance improvement and fire prevention in fly ash collection system at a 50MW wood fired power plant, 12:15752 (RA;US)

WORKERS
See PERSONNEL

WORKING FLUIDS
Thermodynamic Properties
Selection of working fluids for absorption heat pumps, 12:16204 (R;DE;In German)

WWER TYPE REACTORS
See also PAKS-2 REACTOR
Data
Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)
Fuel Assemblies
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Fuel Cans
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Fuel Rods
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Pipes
Control calculations of seismic effects on pipes using integrated program package, 12:16055 (RA;CS;In Czech)
Primary Coolant Circuits
Earthquake resistance problems of primary circuit components, 12:16041 (RA;CS;In Czech)
Protection of WWER type primary loops against extreme effects, 12:16054 (RA;CS;In Czech)
Reactor Accidents
Influence of azimuthal and axial non-uniformities of fuel clad straining on WWER type assembly flow area blockage under accident conditions, 12:16021 (R;SU)
Research of LWR [light water reactor] fuel rod behaviour under accident conditions, 12:16033 (R;XA)
Reactor Safety
Problems of vibration of liquid in axially symmetric tanks, 12:16046 (RA;CS;In Czech)
Reactor Safety Experiments
Quenching rates in 7-rod bundle of zirconium alloy at emergency cooling parameters of WWER, 12:16032 (R;SU;In Russian)
Safety
Small and medium power reactors in the Soviet power-generating industry, 12:15801 (RA;XA)
Seismic Effects
Control calculations of seismic effects on pipes using integrated program package, 12:16055 (RA;CS;In Czech)
Dynamic response of nuclear power plant generating unit at simulated seismic excitation, 12:16045 (RA;CS;In Czech)
Mathematical model for calculating seismic response of type V 213-C reactor, 12:16051 (RA;CS;In Czech)
Physics modelling of reactor V 213-C seismic response, 12:16052 (RA;CS;In Czech)
Problems of vibration of liquid in axially symmetric tanks, 12:16046 (RA;CS;In Czech)
Protection of WWER type primary loops against extreme effects, 12:16054 (RA;CS;In Czech)
Seismology
Safety and operating reliability of the WWER reactor. Seismic load, 12:16038 (R;CS;In Czech)

X

X RADIATION
Angular Distribution
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
Cross Sections
Gas-phase photoemission with soft x-rays: Cross sections and angular distributions, 12:16531 (BA;US)
Diagnostic Uses
Selection of patients for x-ray examinations: skull x-ray examination for trauma, 12:16814 (R;US)
Radiation Effects
Modeling the behavior of optical elements in radiation environments, 12:17326 (R;US)

XENOBIOTICS
Biological Accumulation
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Metabolism
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)
Root Absorption
Uptake and fate of xenobiotics in plants, 12:16891 (RA;US)
Toxicity
Metabolism of chemical mixtures by the upper respiratory tract, 12:16889 (RA;US)

XENON
Pion Minus Reactions
Some topological characteristics of π/sup -/meson interactions with nuclei, 12:17199 (R;SU;In Russian)

X-RASERS
See X-RAY LASERS

X-RAY DETECTION
Multiwire Proportional Chambers
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 12:16652 (J;NL)
Scintillation Counters
CCD[charge-coupled device]-based synchrotron x-ray detector for protein crystallography: Performance projected from an experiment, 12:16600 (R;US)

X-RAY FLUORESCENCE ANALYSIS
Reviews
Status of data and data needs for XRF and PIXE based element analysis, 12:16377 (R;IN)
Synchrotron Radiation Sources
Trace element measurements using white synchrotron radiation, 12:16534 (R;US)

X-RAY LASERS
Reviews
Review of X-ray laser research at CEL-V, 12:16463 (R;FR)

X-RAY SPECTROMETERS
Specifications
Solar flare x-ray polarimetry. Final scientific report, 1 April 1984-30 September 1986, 12:17034 (R;US)

Y

YANG-MILLS THEORY
Lattice Field Theory
Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)
Supersymmetry
Construction of finite N=1 supersymmetric Yang-Mills theories, 12:17159 (R;SU)
Thermodynamics
Continuum limit and finite size effects in lattice thermodynamics of Yang-Mills fields, 12:17169 (R;SU;In Russian)
Ultraviolet Divergences
Construction of finite N=1 supersymmetric Yang-Mills theories, 12:17159 (R;SU)
YEREVAN SYNCHROTRON
See EREVAN SYNCHROTRON
YTTERBIUM COMPOUNDS
F States
What underlies the Anderson Hamiltonian, 12:17357 (R;US)
Hamiltonians
What underlies the Anderson Hamiltonian, 12:17357 (R;US)
YTTRIUM 89 TARGET
Neutron Reactions
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
YTTRIUM ALUMINIUM GARNETS
See ALUMINIUM OXIDES
YTTRIUM OXIDES
Voids
NDE reliability and process control for structural ceramics, 12:16333 (R;US)
YUCCA MOUNTAIN
Drill Cores
Fran Ridge horizontal coring summary report hole UE-25h No. 1, Yucca Mountain Area, Nye County, Nevada, 12:16918 (R;US)

Z

ZEOLITES
Catalytic Effects
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Chemical trapping of CO/H_2 surface species: Quarterly report, 12:15286 (R;US)
Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas, 12:16405 (R;DE;In German)
NMR Spectra
A new method of magnetic characterization of zeolite-cobalt catalysts: Quarterly technical progress report 5, Oct. 1, 1986 through Jan. 30, 1987, 12:16403 (R;US)
Synthesis
Synthesis and modification of zeolite catalysts for producing short-chain olefins from methanol and synthesis gas, 12:16405 (R;DE;In German)
ZINC
Biological Localization
Microlocalization of brain zinc in zinc-deficient rats, 12:16907 (J;US)
Ecological Concentration
A review of the chemical record in lake sediment of energy related air pollution and its effects on lakes, 12:16733 (J;NL)
Emission Spectroscopy
Partition chromatograph separation-spectrometry for the determination of 29 trace elements in PuO/sub 2/, 12:16383 (R;CN;In Chinese)
Nutritional Deficiency
Microlocalization of brain zinc in zinc-deficient rats, 12:16907 (J;US)
ZINC ALLOYS
Physical Properties
Low temperature properties of $CeCu_6$ and related compounds, 12:16285 (R;US)
ZINC COMPLEXES
Oxidation
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
Photochemical Reactions
Photooxidation of tetraanionic sensitizer ions by dihexadecyl phosphate vesicle-bound viologens, 12:16425 (J;US)
ZINC COMPOUNDS
See also ZINC TELLURIDES
Air Pollution Control
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
Environmental Impacts
Studies on air pollution by lead, zinc, iron, and 3,4-benzopyrene due to traffic in a small town, 12:16235 (R;DE;In German)
ZINC FLUORIDES
Phase Transformations
The role of point defects on structural phase transitions: Progress report for the year 1986-1987 (Li-doped $KMnF_3$, $KZnF_3$; $K(Ta,Nb)O_3$), 12:16355 (R;US)
ZINC TELLURIDES
Crystal Growth
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Microhardness
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
Photoconductivity
Zone leveling and solution growth of complex compound semiconductors in space. Final report, 1 May 1983-30 September 1986, 12:16361 (R;US)
ZIRCALOY
For unspecified Zircaloy alloys.
See also ZIRCALOY 2
ZIRCALOY 4
Fuel Cans
PWR [pressurized water reactor] fuel element behavior at temperatures up to 2350°C, 12:16023 (R;DE)
Relocation of zircaloy-clad uranium dioxide under severe accident conditions, 12:16027 (R;US)
ZIRCALOY 2
Quenching
Surface quenching of zirconium alloys by laser, 12:16246 (R;FR;In French)
ZIRCALOY 4
Quenching
Surface quenching of zirconium alloys by laser, 12:16246 (R;FR;In French)
ZIRCONIUM
Neutron Reactions
Neutron scattering on nuclei near A = 60 and A = 90, 12:17257 (R;US)
ZIRCONIUM 90 TARGET
Neutron Reactions
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)
Proton Reactions
Noneikonal effects in cross sections of proton reactions on nuclei, 12:17282 (RA;SU;In Russian)
ZIRCONIUM 91 TARGET
Neutron Reactions
Structure effects in (n,α) reactions on Nd and Zr isotopes, 12:17228 (R;FR)
ZIRCONIUM ALLOYS
See also VANSTAR 7
ZIRCONIUM BASE ALLOYS

Atom Transport
Diffusion and ion mixing in amorphous alloys, 12:16249 (R;US)
Corrosion
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)
Fuel Cans
Characteristics of corrosion behaviour of Zr 1% Nb WWER fuel claddings within 700 to 1000°C on long-term exposures, 12:15797 (R;SU)

ZIRCONIUM BASE ALLOYS
See also ZIRCALOY
Corrosion Resistance
Technique and preliminary results for in-reactor investigation of corrosion and mechanical behaviour of zirconium alloys under non-isothermal conditions, 12:16292 (R;SU;In Russian)
Radiation Effects
Technique and preliminary results for in-reactor investigation of corrosion and mechanical behaviour of zirconium alloys under non-isothermal conditions, 12:16292 (R;SU;In Russian)

ZIRCONIUM COMPOUNDS
See also ZIRCONIUM FLUORIDES
ZIRCONIUM OXIDES
Chemical Preparation
Synthesis, structure, and spectroscopic properties of early transition metal eta²-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Crystal Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta²-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)
Molecular Structure
Synthesis, structure, and spectroscopic properties of early transition metal eta²-iminoacyl complexes containing aryl oxide ligation, 12:16409 (J;US)

ZIRCONIUM FLUORIDES
Spectra
Vibrational characteristics and structure of heavy metal fluoride glasses containing thorium and zirconium, 12:16334 (R;US)

ZIRCONIUM OXIDES
Crystal Defects
Theoretical studies of defects in binary and ternary oxides, 12:16329 (R;US)
Fracture Mechanics
Fracture mechanisms in lead zirconate titanate ceramics, 12:16338 (BA;US)
Fracture Properties
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Metallurgical Effects
Transformation toughening in the $Al_2O_3Cr_2O_3$ /ZrO_2 - HPO_2 system: the effect of ZrO_2-HFO_2 content, 12:16337 (BA;US)
Phase Transformations
Theory of the energetics and nonclassical nucleation for the tetragonal-monoclinic transformation of zirconia, 12:16328 (R;US)

CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which documents announced in this publication were prepared are included in this index.

Contract No.	Abstract No.	Report No.
AA03-76SF00034	**California Univ., Los Angeles, USA. Dept. of Physics; California Univ., Berkeley, USA. Dept. of Phys**	
	12:17388	Physics Letters [Section] B 181 NO. 3/4. 263-268 (4 Dec 1986).
AC01-84DP93032	**National Research Council, Washington, DC (USA). Uranium Mill Tailings Study Panel**	
	12:15560	DOE/DP/93032—T1
AC01-85DP50053	**USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of International Security Affairs**	
	12:16162	DOE/DP/50053—T1
AC02-76CH00016	**Brookhaven National Lab., Upton, NY (USA)**	
	12:15269	BNL—38267
	12:15408	BNL-NUREG—39007
	12:15439	NUREG/CR—4730
	12:15587	BNL—39087
	12:15588	BNL—39088
	12:15589	BNL—39089
	12:15598	BNL—38870
	12:16004	BNL-NUREG—39048
	12:16005	BNL-NUREG—39156
	12:16006	BNL-NUREG—39157
	12:16158	BNL—39110
	12:16240	BNL—39052
	12:16241	BNL—39096
	Battelle Columbus Labs., OH (USA)	
	12:16242	BNL—52049
	12:16335	Journal of Solid State Chemistry 66 NO. 1. 105-115 (Jan 1987).
	12:16432	Radiochimica Acta 39 NO. 4. 189-194 (1986).
	12:16468	Optics Communications 53 NO. 3. 197-202 (1 Mar 1985).
	Brookhaven National Lab., Upton, NY (USA)	
	12:16533	BNL—38938
	12:16534	BNL—39105
	12:16535	BNL—39109
	12:16571	BNL—39057
	12:16595	BNL—39104
	12:16652	Nuclear Instruments and Methods in Physics Research 252 NO. 2/3. 239-245 (1 Dec 1986).
	12:16732	Water, Air, and Soil Pollution 30 NO. 1-2. 143-152 (Sep 1986).
	12:16786	Deep-Sea Research, Part A: Oceanographic Research Papers 32 NO. 7. 853-883 (1985).
	12:16794	BNL—38848
	Vanderbilt Univ., Nashville, TN (USA). School of Medicine	
	12:16884	BNL—38969
	Brookhaven National Lab., Upton, NY (USA)	
	12:16885	BNL—39169
	12:16907	Federation Proceedings, Federation of American Societies for Experimental Biology 45 NO. 4
	12:17058	BNL—38963
	12:17096	BNL—39168
	Purdue Univ., Lafayette, IN (USA). Dept. of Physics	
	12:17126	BNL—39062
	Brookhaven National Lab., Upton, NY (USA)	
	12:17216	BNL-NCS—38907
	12:17239	BNL—38491
	Schlumberger-Doll Research Center, Ridgefield, CT (USA)	
	12:17337	BNL—39054
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (USA)**	
	12:16549	FNAL/C—86/156
	12:16550	FNAL-TM—1436
	12:16551	FNAL-TM—1437
	12:16611	FNAL-TM—1434
	12:16812	FNAL-TM—1428
AC02-76CH03073	**Los Alamos National Lab., NM (USA)**	
	12:17439	LA—10830-C(Sep 1986).
	12:17440	LA—10830-C(Sep 1986).
	12:17441	LA—10830-C(Sep 1986).
	12:17444	LA—10830-C(Sep 1986).
AC02-76ER01198	**Univ. of Illinois at Urbana-Champaign**	
	12:16315	Solid State Communications 50 NO. 4. 327-330 (1984).
AC02-76ER01338	**Michigan State Univ., East Lansing**	
	12:16810	Planta 164 308-320 (1985).
AC02-76ER03231	**Brandeis Univ., Waltham, MA (USA)**	
	12:15602	DOE/ER/03231—10
AC02-76ER03244	**Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics**	
	12:17098	DOE/ER/03244—134
AC02-77ET53005	**Los Alamos National Lab., NM (USA)**	
	12:17480	LA—10830-C(Sep 1986).
AC02-79ER10420	**Kansas Univ., Lawrence (USA). Dept. of Physics and Astronomy**	
	12:17209	DOE/ER/10420—8
AC02-79ER10514	**Kansas State Univ., Manhattan (USA). Dept. of Physics**	
	12:17068	DOE/ER/10514—T3
AC02-79EV10091	**Univ. of Michigan Biological Station, Ann Arbor**	
	12:16805	American Journal of Botany 73 NO. 1. 131-138 (1986).
AC02-79EV10097	**Columbia Univ., Palisades, NY**	
	12:16922	Quaternary Science Reviews 4 59-108 (1985).
AC02-79EV10098	**Univ. of East Anglia, Norwich, England**	
	12:16761	Nature (London) 315 NO. 6021. 649-652 (20 Jun 1985).
	12:16772	Climatic Change 9 129-147 (1986).
AC02-80CS83004	**Institute of Gas Technology, Chicago, IL (USA)**	
	12:15599	CONF-860405—7
AC02-80ER10694	**Massachusetts Inst. of Tech., Cambridge (USA)**	
	12:16420	DOE/ER/10694—1-Final
AC02-80ET15601	**Mississippi State Univ., Mississippi State (USA). MHD Energy Center**	
	12:16186	DOE/ET/15601—8

Contract No.	Abstract No.	Report No.
AC02-81ER10888	**Washington Univ., St. Louis, MO**	
	12:16803	Journal of Bacteriology 168 NO. 3. 1291-1301 (Dec 1986).
	12:16804	Journal of Bacteriology 168 NO. 3. 1283-1290 (Dec 1986).
AC02-81ER10950	**Massachusetts Univ., Amherst (USA). Dept. of Mechanical Engineering**	
	12:16330	CONF-8310105—2
AC02-81ER60023	**Atmospheric and Environmental Research Inc., Cambridge, MA**	
	12:16759	Journal of Geophysical Research 90 NO. D7. 13,081-13,086 (20 Dec 1985).
	12:16760	Journal of Geophysical Research 90 NO. D7. 12,971-12,980 (20 Dec 1985).
AC02-83CH10093	**Solar Energy Research Inst., Golden, CO (USA)**	
	12:15597	SERI/TR—215-2948
	12:15613	SERI/SP—232-3079
	Chevron Research Co., Richmond, CA (USA)	
	12:15614	SERI/STR—211-3053
AC02-83CH10140	**NUS Corp., Gaithersburg, MD (USA)**	
	12:15487	BMI/ONWI—617
	Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation	
	12:16924	BMI/ONWI—630
	IT Corp., Albuquerque, NM (USA)	
	12:16925	BMI/ONWI—631
AC02-83CH10156	**Arawak Consulting Corp., New York (USA)**	
	12:16201	DOE/CE/10156—1
AC02-83ER13137	**Illinois Univ., Chicago (USA). Dept. of Physics**	
	12:17066	CONF-860845—4
AC02-86ER40257	**Drexel Univ., Philadelphia, PA (USA). Dept. of Physics and Atmospheric Science**	
	12:17100	DOE/ER/40257—001
AC03-76SF00012	**Univ. of California, Los Angeles**	
	12:16843	Ecology (English Translation) 66 NO. 2. 378-387 (Apr 1985).
AC03-76SF00098	**Materials and Molecular Research Div., Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 947**	
	12:15297	Preprints of Papers, American Chemical Society, Division of Fuel Chemistry 31 NO. 3. 158-1
	Lawrence Berkeley Lab., CA (USA)	
	12:15760	LBL—22261
	12:16203	LBL—21862
	12:16300	Journal of Physical Chemistry 90 NO. 26. 6811-6817 (18 Dec 1986).
	12:16417	Journal of Physical Chemistry 90 NO. 26. 6790-6793 (18 Dec 1986).
	12:16565	LBL—21293
	12:16566	LBL—22445
	12:16567	LBL—22450
	Brookhaven National Lab., Upton, NY (USA)	
	12:16589	BNL—51959(Oct 1985).
	12:16650	Nuclear Instruments and Methods in Physics Research 253 NO. 1. 1-9 (15 Dec 1986).
	12:16651	Nuclear Instruments and Methods in Physics Research 253 NO. 1. 65-72 (15 Dec 1986).
	12:16655	Nuclear Instruments and Methods in Physics Research 252 NO. 2/3. 478-482 (1 Dec 1986).
	12:16734	Journal of Geophysical Research 91 NO. D6. 6659-6667 (20 May 1986).
	12:16796	Journal of Bacteriology 168 NO. 3. 1180-1188 (Dec 1986).
	Lawrence Berkeley Lab., CA (USA)	
	12:16919	LBL—22559
	12:17081	LBL—22282
	California Univ., Berkeley (USA)	
	12:17082	LBL—22418
	Lawrence Berkeley Lab., CA (USA)	
	12:17180	LBL—22277
	12:17183	Nuclear Physics [Section] B 281 NO. 3/4. 546-572 (2 Feb 1987).
	12:17207	LBL—22560
	12:17616	Fusion Technology 10 NO. 3. 1424-1426 (Nov 1986).
AC03-76SF00515	**Stanford Linear Accelerator Center, Menlo Park, CA (USA)**	
	12:16516	SLAC-PUB—4179
	12:16653	Nuclear Instruments and Methods in Physics Research 252 NO. 2/3. 343-349 (1 Dec 1986).
	12:16656	Nuclear Instruments and Methods in Physics Research 252 NO. 2/3. 547-563 (1 Dec 1986).
	12:16658	Nuclear Instruments and Methods in Physics Research 252 NO. 2/3. 295-298 (1 Dec 1986).
	12:17156	Nuclear Physics [Section] B 281 NO. 3/4. 399-410 (2 Feb 1987).
	12:17157	Nuclear Physics [Section] B 281 NO. 1/2. 41-71 (19 Jan 1987).
	12:17325	SLAC-PUB—4203
AC04-76DP00053	**Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter**	
	12:15519	CONF-860203—(Dec 1986).
AC04-76DP00656	**General Electric Co., Largo, FL (USA). Neutron Devices Dept.**	
	12:15667	GEPP-TIS—366d
AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
	12:15367	SAND—86-1865
	Pacific Northwest Lab., Richland, WA (USA)	
	12:15437	NUREG/CP—0079(Aug 1986).
	12:15438	NUREG/CP—0079(Aug 1986).
	Sandia National Labs., Albuquerque, NM (USA)	
	12:15448	SAND—86-2414C
	Intera Technologies, Inc., Austin, TX (USA)	
	12:15449	SAND—86-7161
	Naval Ocean Research and Development Activity, NSTL, MS (USA)	
	12:15450	SAND—86-7172
	Sandia National Labs., Albuquerque, NM (USA)	
	12:15611	SAND—86-2181C
	SERA Solar Corp., Santa Clara, CA (USA)	
	12:15612	SAND—86-7051
	Meridian Corp., Falls Church, VA (USA)	
	12:15616	SAND—85-7018/1
	Sandia National Labs., Albuquerque, NM (USA)	
	12:15617	SAND—86-0272C
	12:15630	SAND—87-0073C
	12:16061	NUREG/CR—4320
	12:16062	SAND—86-2909C
	12:16236	SAND—86-2759
	12:16296	SAND—86-2814C
	12:16297	SAND—86-2856C
	12:16334	SAND—86-2126C
	12:16445	SAND—86-1907C
	12:16446	SAND—86-2474C
	12:16467	SAND—86-2121C

Contract No.	Abstract No.	Report No.
	12:16679	SAND—86-2553C
	12:16740	Journal of Volcanology and Geothermal Research 28 107-140 (1986).
	12:16921	SAND—87-7001C
	12:17487	SAND—86-1382C
AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
	12:16295	RFP—4060
AC04-76DR00789	**McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)**	
	12:15620	SAND—86-8187
AC04-76EV01013	**USDOE Office of Energy Research, Washington, DC**	
	12:16889	CONF-8606161—(Aug 1986).
	12:16890	CONF-8606161—(Aug 1986).
	12:16893	CONF-8606161—(Aug 1986).
	12:16894	CONF-8606161—(Aug 1986).
	12:16897	CONF-8606161—(Aug 1986).
	12:17552	Fusion Technology 10 NO. 3. 1228-1233 (Nov 1986).
AC04-86AL31950	**I. T. Corp., Carlsbad, NM (USA)**	
	12:15488	DOE/WIPP—86-006
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	12:15366	DOE/OR/00033—T253
	12:15423	DOE/OR/00033—T251
	12:15424	DOE/OR/00033—T254
	12:15924	DOE/OR/00033—T252
	12:16209	ORAU/IEA—86-2(M)
	12:16217	DOE/OR/00033—T259
	12:16218	DOE/OR/00033—T263
	12:16219	DOE/OR/00033—T268
	12:16220	DOE/OR/00033—T269
	Institute for Energy Analysis, Washington, DC (USA)	
	12:16701	CONF-840851—5
AC05-84OR21400	**Battelle Columbus Div., OH (USA)**	
	12:15290	ORNL/Sub—81-69611/02
	Oak Ridge National Lab., TN (USA)	
	12:15362	ORNL/TM—10198
	12:15414	CONF-870306—5
	12:15415	CONF-870306—6
	12:15416	CONF-870306—7
	12:15417	CONF-870306—8
	12:15441	ORNL/TM—10226
	Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter	
	12:15491	CONF-860203—(Dec 1986).
	12:15501	CONF-860203—(Dec 1986).
	12:15504	CONF-860203—(Dec 1986).
	12:15505	CONF-860203—(Dec 1986).
	12:15520	CONF-860203—(Dec 1986).
	12:15536	CONF-860203—(Dec 1986).
	12:15538	CONF-860203—(Dec 1986).
	12:15554	CONF-860203—(Dec 1986).
	Oak Ridge National Lab., TN (USA)	
	12:15586	CONF-870253—1
	12:15622	ORNL—6359
	Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Systems Technology Div.	
	12:15666	CONF-870203—1
	McGraw-Edison Power Systems Div., Franksville, WI (USA). Thomas A. Edison Technical Center	
	12:15668	ORNL/Sub—85-28611/1
	Oak Ridge National Lab., TN (USA)	
	12:15763	CONF-8610135—43
	12:15867	ORNL/TM—10267
	12:16160	ORNL/PPA—87/1
	12:16173	DOE/OR/21400—T286
	12:16205	ORNL/TM—10264/V1
	12:16258	CONF-861207—46
	12:16264	CONF-861207—58
	Tennessee Univ., Knoxville (USA). Dept. of Physics	
	12:16293	ORNL/M—294
	12:16304	Materials Research Society Symposia Proceedings 41 89-94 (1985).
	12:16305	Materials Research Society Symposia Proceedings 41 25-30 (1985).
	12:16306	Materials Research Society Symposia Proceedings 35 119-124 (1985).
	12:16314	Physical Review [Section] B: Condensed Matter 30 NO. 6. 3039-3046 (15 Sep 1984).
	12:16341	Materials Research Society Symposia Proceedings 41 295-299 (1985).
	12:16364	Materials Research Society Symposia Proceedings 36 151-156 (1986).
	12:16368	Materials Research Society Symposia Proceedings 35 101-106 (1985).
	12:16369	Materials Research Society Symposia Proceedings 35 113-118 (1985).
	12:16370	Materials Research Society Symposia Proceedings 35 159-168 (1985).
	Oak Ridge National Lab., TN (USA)	
	12:16408	ORNL/TM—10324
	12:16440	CONF-870134—1
	12:16441	CONF-870301—6
	Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.	
	12:16591	CONF-861114—28
	Oak Ridge National Lab., TN (USA)	
	12:16689	NDP—002
	East Anglia Univ. (UK). Climatic Research Unit	
	12:16690	NDP—003
	National Oceanic and Atmospheric Administration, Silver Spring, MD (USA)	
	12:16691	NDP—008
	Brown Univ., Providence, RI (USA)	
	12:16692	NDP—011
	Massachusetts Univ., Amherst (USA)	
	12:16693	NDP—012
	National Oceanic and Atmospheric Administration, Boulder, CO (USA)	
	12:16694	NDP—014
	Oak Ridge Associated Universities, Inc., TN (USA)	
	12:16700	CMP—002
	California Univ., San Diego, La Jolla (USA)	
	12:16708	NDP—001
	Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.)	
	12:16709	NDP—004
	Oak Ridge National Lab., TN (USA)	
	12:16710	NDP—017
	12:16736	Nature (London) 319 195-199 (16 Jan 1986).
	12:16739	Annual Review of Earth and Planetary Sciences 14 201-235 (1986).
	12:16773	CONF-8608141—1
	12:16782	ORNL/ESH—1/V24
	12:16787	Continental Shelf Research 4 NO. 4. 465-483 (1985).
	12:16811	DOE/OR/21400—T283
	12:16813	ORNL/TM—10294
	12:16859	ORNL—6338
	USDOE Office of Energy Research, Washington, DC	
	12:16887	CONF-8606161—(Aug 1986).
	12:16888	CONF-8606161—(Aug 1986).
	12:16895	CONF-8606161—(Aug 1986).
	12:16908	Plant Physiology 82 83-89 (1986).
	Oak Ridge National Lab., TN (USA)	
	12:16912	CONF-8611117—2
	12:16913	CONF-8611117—3
	Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.	
	12:17065	CONF-860148—10

Contract No.	Abstract No.	Report No.
	12:17084	Physics Letters [Section] B 182 NO. 3/4. 251-255 (25 Dec 1986).
	Oak Ridge National Lab., TN (USA)	
	12:17338	CONF-850484—
	12:17340	CONF-870144—1
	Tennessee Univ., Knoxville (USA). Dept. of Physics	
	12:17353	ORNL/M—295
	Oak Ridge National Lab., TN (USA)	
	12:17358	CONF-861247—1
	12:17415	ORNL/TM—9475
	12:17432	CONF-870301—10
	12:17486	ORNL/FEDC—85/10
	12:17492	Fusion Technology 10 NO. 3. 481-490 (Nov 1986).
	12:17535	Fusion Technology 10 NO. 3. 498-503 (Nov 1986).
	12:17570	Fusion Technology 10 NO. 3. 527-532 (Nov 1986).
	12:17583	Fusion Technology 10 NO. 3. 1006-1014 (Nov 1986).
	12:17641	CONF-861096—3
	Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)	
	12:17642	CONF-870355—3
	Oak Ridge National Lab., TN (USA)	
	12:17654	ORNL/CSD/TM—240
	12:17655	ORNL/TM—10038
AC06-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
	12:15377	HEDL-SA—3534-FP
	12:15852	HEDL-SA—2939-A(May 1983).
	12:15853	HEDL-SA—3336-FP
	12:15854	HEDL-SA—3475-FP
	12:15855	HEDL-SA—3484-FP
	12:15983	HEDL-SA—3363-FP
	12:15984	HEDL-SA—3589-FP
	12:16275	HEDL—7612
	12:16276	HEDL—7627
	12:16277	HEDL-SA—3280-FP
	12:16278	HEDL-SA—3319-FP
AC06-76RL01830	**Pacific Northwest Lab., Richland, WA (USA)**	
	12:15295	PNL-SA—14167
	USDOE Office of Energy Research, Washington, DC	
	12:15337	CONF-8606161—(Aug 1986).
	Pacific Northwest Lab., Richland, WA (USA)	
	12:15445	PNL—5929
	12:15446	PNL-SA—13772
	12:15447	PNL-SA—14054
	Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter	
	12:15557	CONF-860203—(Dec 1986).
	Pacific Northwest Lab., Richland, WA (USA)	
	12:15610	PNL—6141
	12:15773	NUREG/CR—4300-Vol.3-No.2
	12:16294	PNL-SA—14033
	12:16367	Materials Research Society Symposia Proceedings 48 461-469 (1985).
	12:16878	PNL-SA—14209
	12:16920	PNL—6087
	12:17631	PNL-SA—14407
	12:17656	PNL-SA—14017
AC06-77RL01030	**Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter**	
	12:15503	CONF-860203—(Dec 1986).
	12:15545	CONF-860203—(Dec 1986).
AC06-80ER53098	**Los Alamos National Lab., NM (USA)**	
	12:17465	LA—10830-C(Sep 1986).
AC06-83ER13111	**Oregon Graduate Center, Beaverton**	
	12:16425	Journal of the American Chemical Society 109 NO. 2. 507-515 (21 Jan 1987).

Contract No.	Abstract No.	Report No.
AC06-84ER40124	**Washington Univ., Seattle (USA). Nuclear Physics Lab.**	
	12:16522	DOE/ER/40124—12
	12:16543	DOE/ER/40124—10
AC06-84RL10436	**Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter**	
	12:15507	CONF-860203—(Dec 1986).
AC07-76ID01570	**EG and G Idaho, Inc., Idaho Falls (USA)**	
	12:15397	EGG—2491
	12:15398	EGG-NERD—7444
	Oak Ridge National Lab., TN (USA)	
	12:15800	GEND—058
	EG and G Idaho, Inc., Idaho Falls (USA)	
	12:16024	EGG-M—25986
	12:16025	EGG-M—27686
	12:16026	EGG-M—32686
	12:16027	EGG-M—36186
	12:16269	EGG-M—18286
	12:16923	EGG-PHY—7223
	12:17330	EGG-M—19086
AC08-83NV10282	**EG and G Energy Measurements, Inc., Las Vegas, NV (USA)**	
	12:16914	EGG—10282-1122
AC08-84NV10327	**Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA)**	
	12:15418	CONF-870306—11
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
	12:15376	DP—1709
	12:15385	DP—1673
	12:15386	DP—1718
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant	
	12:15387	DP-MS—86-167
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.	
	12:15425	DPST—85-547
	12:16356	DP—1728
	12:16809	Forest Ecology and Management 11 203-224 (1985).
	12:17648	DP-MS—86-137
AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (USA)**	
	12:15857	WAPD-TM—1548
	12:16395	WAPD-T—2873
	12:16674	WAPD-TM—1616
AC21-82MC19281	**PEDCo-Environmental, Inc., Cincinnati, OH (USA)**	
	12:15680	DOE/MC/19281—T1
AC21-82MC19403	**Institute of Gas Technology, Chicago, IL (USA)**	
	12:15270	CONF-850522—3
AC21-83MC20050	**Westinghouse Electric Corp., Pittsburgh, PA (USA). Chemical Sciences Div.**	
	12:15276	DOE/MC/20050—2226
AC21-83MC20230	**Helipump, Inc., Brecksville, OH (USA)**	
	12:15277	DOE/MC/20230—T5
AC21-84MC21004	**Advanced Fuel Research, Inc., East Hartford, CT (USA)**	
	12:15278	DOE/MC/21004—T3
	12:15279	DOE/MC/21004—T4
	12:15280	DOE/MC/21004—T5
AC21-84MC21313	**Institute of Gas Technology, Chicago, IL (USA)**	
	12:15271	CONF-860948—5
AC21-85MC22044	**West Virginia Univ., Morgantown (USA)**	
	12:15355	DOE/MC/22044—3
AC21-85MC22059	**Brigham Young Univ., Provo, UT (USA). Combustion Lab.**	
	12:15281	DOE/MC/22059—2268
AC22-83PC60775	**Institute of Gas Technology, Chicago, IL (USA)**	
	12:15274	CONF-8608150—1
AC22-83PC63032	**TRW Space and Technology Group, Redondo Beach, CA (USA)**	
	12:15282	DOE/PC/63032—T16

Contract No.	Abstract No.	Report No.
AC22-84PC72008	TRW Space and Technology Group, Redondo Beach, CA (USA). Energy Div.	
	12:15283	DOE/PC/72008—T8
AC22-85PC80016	SRI International, Menlo Park, CA (USA)	
	12:15284	DOE/PC/80016—T2
AC22-85PC80023	Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering	
	12:15285	DOE/PC/80023—T7
AC22-86PC90751	Physical Sciences, Inc., Andover, MA (USA)	
	12:15328	DOE/PC/90751—T1
AI01-76ET20356	Jet Propulsion Lab., Pasadena, CA (USA)	
	12:15603	DOE/JPL—1012-113
AI01-81ER60001	North Carolina State Univ., Raleigh	
	12:16764	Ecological Modelling 29 107-129 (1985).
AI01-82ER13007	Jet Propulsion Lab., Pasadena, CA (USA)	
	12:17342	DOE/ER/13007—1
AI01-85CE89008	Jet Propulsion Lab., Pasadena, CA (USA)	
	12:15604	DOE/JPL—1012-120
	12:15605	DOE/JPL—1012-121
	12:15606	DOE/JPL—1012-123
	12:17647	DOE/JPL—1012-115
AI04-80AL13137	Jet Propulsion Lab., Pasadena, CA (USA)	
	12:15619	DOE/JPL/1060—96
AI09-86SR15122	Forest Service, Athens, GA (USA). Southeastern Forest Experiment Station	
	12:16886	CONF-8509370—1
AS03-76ER72012	California Inst. of Tech., Pasadena (USA)	
	12:17087	DOE/ER/72012—T4
AS03-81ER40029	Northeastern Univ., Boston, MA (USA). Dept. of Physics	
	12:17182	NUB—2663
AS05-76ER04310	Smithsonian Environmental Research Center, Rockville, MD	
	12:16806	Plant Physiology 79 NO. 4. 943-948 (Dec 1985).
AS05-76ER04936	Tennessee Univ., Knoxville (USA)	
	12:17235	CONF-8605150—3
AS05-81ER10947	Universite Libre de Bruxelles, Belgium	
	12:16419	Chemical Engineering Science 41 NO. 12. 3111-3117 (1986).
AS05-81EV10539	Univ. of Maryland, College Park	
	12:16697	Monthly Weather Review 114 546-560 (Mar 1986).
AS05-82ER12061	Rutgers Univ., Piscataway, NJ	
	12:16303	Journal of Magnetism and Magnetic Materials 47 NO. 48. 1-3 (1985).
AS05-83DP48013	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Management Systems Labs.	
	12:15563	DOE/DP/48013—T1
AS09-80ER10690	South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy	
	12:17099	DOE/ER/10690—7
AS19-84BC10828	East Carolina Univ., Greenville, NC (USA). Dept. of Mathematics	
	12:17633	DOE/BC/10828—2
AT03-76EV10109	Univ. of California, Berkeley	
	12:16798	Experimental Cell Biology 163 NO. 2. 500-508 (Apr 1986).
AT06-70ER73019	Univ. of Washington, Seattle	
	12:16808	Plant Physiology 79 NO. 4. 1080-1085 (Dec 1985).
AT06-71EV70024	Univ. of Washington, Seattle	
	12:16929	Geochimica et Cosmochimica Acta 50 NO. 3. 353-369 (Mar 1986).
AT21-79MC12841	Physical Sciences, Inc., Woburn, MA (USA)	
	12:16193	DOE/MC/12841—2254
FC03-80RA50075	Univ. of Nevada, Las Vegas	
	12:15627	Geo-Heat Center Quarterly Bulletin 8 NO. 2. 3-6, 17 (Win 1984).
FC07-81ID12227	National Food Processors Association, Berkeley, CA	
	12:16853	Journal of Food Science 51 NO. 2. 403-407 (Mar-Apr 1986).
	12:16854	Journal of Food Science 51 NO. 2. 395-398 (Mar-Apr 1986).
FC21-83FE60177	Western Research Inst., Laramie, WY (USA)	
	12:15375	DOE/FE/60177—2224
FC21-83FE60181	North Dakota Univ., Grand Forks (USA). Energy Research Center	
	12:15310	DOE/FE/60181—2271
FG01-84FE60425	Commonwealth Scientific and Industrial Research Organization, Sydney (Australia)	
	12:15267	(1985).
FG01-86CE63487	Goldenrod Hills Community Action Agency, Walthill, NE (USA). Tri-County Council	
	12:15595	DOE/CE/63487—T2
FG02-84ER13247	Colorado Univ., Boulder (USA)	
	12:16423	DOE/ER/13247—3
FG02-84ER13295	Pennsylvania State Univ., University Park	
	12:16413	Journal of the American Chemical Society 109 NO. 1. 148-156 (7 Jan 1987).
FG02-84ER45056	Connecticut Univ., Storrs (USA)	
	12:16351	DOE/ER/45056—3
	12:16352	DOE/ER/45056—4
	12:16353	DOE/ER/45056—5
FG02-84ER45091	Stevens Inst. of Tech., Hoboken, NJ (USA). Dept. of Materials and Metallurgical Engineering	
	12:16265	DOE/ER/45091—3
FG02-84ER45116	Massachusetts Inst. of Tech., Cambridge (USA)	
	12:16266	DOE/ER/45116—16
	12:16267	DOE/ER/45116—17
	12:16354	DOE/ER/45116—18
FG02-84ER60253	Kansas State Univ., Manhattan	
	12:16906	Agricultural and Forest Meteorology 37 NO. 2. 109-122 (Jul 1986).
FG02-85ER13437	Princeton Univ., NJ	
	12:16927	Geochimica et Cosmochimica Acta 50 NO. 11. 2461-2466 (Nov 1986).
FG02-85ER13442	National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center	
	12:16941	CONF-8607112—1
FG02-85ER45201	Rochester Univ., NY (USA). Dept. of Mechanical Engineering	
	12:17341	CONF-8508107—3
FG02-86CH10272	Mille Lacs Band of Chippewa Indians, Onamia, MN (USA)	
	12:15419	DOE/CH/10272—1
FG02-86CH10276	Leech Lake Reservation Business Committee, Cass Lake, MN (USA)	
	12:15420	DOE/CH/10276—1
FG02-86CH10282	Foth and Van Dyke and Associates, Inc., Green Bay, WI (USA). Waste/Energy Div.	
	12:15421	DOE/CH/10282—1
FG02-86ER45255	Michigan Technological Univ., Houghton (USA). Dept. of Metallurgical Engineering	
	12:16268	DOE/ER/45255—1
FG02-86ER45258	Lehigh Univ., Bethlehem, PA (USA)	
	12:16355	DOE/ER/45258—1
FG03-85ER13431	California Institute of Technology, Pasadena	
	12:16414	Journal of the American Chemical Society 109 NO. 1. 203-219 (7 Jan 1987).
FG03-85ER25009	California Inst. of Tech., Pasadena (USA)	
	12:16682	DOE/ER/25009—388
	12:17343	DOE/ER/25009—371
	12:17645	DOE/ER/25009—290B

Contract No.	Abstract No.	Report No.
	California Inst. of Tech., Pasadena (USA). Dept. of Physics	
	12:17646	DOE/ER/25009—378
FG05-78ER10005	**North Carolina Central Univ., Durham (USA). Dept. of Physics**	
	12:17400	DOE/ER/10005—T1
FG05-80ET53088	**Texas Univ., Austin (USA). Inst. for Fusion Studies**	
	12:17401	DOE/ET/53088—267
	Los Alamos National Lab., NM (USA)	
	12:17483	LA—10830-C(Sep 1986).
FG05-84ER40154	**Kentucky Univ., Lexington (USA)**	
	12:17258	DOE/ER/40154—3
FG05-84ER40159	**Louisiana State Univ., Baton Rouge (USA). Dept. of Physics and Astronomy**	
	12:17193	DOE/ER/40159—113
FG05-85ER13326	**National Research Council, Washington, DC (USA). Committee on Atomic and Molecular Science**	
	12:17069	DOE/ER/13326—T2
FG05-85ER13357	**Auburn Univ., AL (USA). Dept. of Chemical Engineering**	
	12:16384	DOE/ER/13357—5
FG05-85ER40226	**Vanderbilt Univ., Nashville, TN (USA)**	
	12:17161	DOE/ER/40226—2
FG05-85ER60348	**Old Dominion Univ., Norfolk, VA (USA). Research Foundation**	
	12:16933	DOE/ER/60348—5
FG05-86ER40265	**Lawrence Berkeley Lab., CA, USA; Ohio State Univ., Columbus, USA. Dept. of Physics; California Univ.**	
	12:17184	Physics Letters [Section] B 181 NO. 3/4. 244-248 (4 Dec 1986).
FG06-84ER13280	**Washington Univ., Seattle (USA)**	
	12:17085	(1984).
FG07-84ID12514	**Arizona Univ., Tucson (USA)**	
	12:15422	DOE/ID/12514—T1
FG07-84ID12543	**Utah Geological and Mineral Survey, Salt Lake City (USA)**	
	12:15625	DOE/ID/12543—2
FG08-84ER45107	**Nevada Univ., Reno (USA)**	
	12:16402	DOE/ER/45107—2
FG09-86ER60435	**Georgia Univ., Athens (USA)**	
	12:16934	DOE/ER/60435—T2
FG22-83PC60039	**Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering**	
	12:15301	DOE/PC/60039—11
FG22-85PC80505	**Maryland Univ., College Park (USA)**	
	12:15302	DOE/PC/80505—T5
FG22-85PC80524	**Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering**	
	12:15324	DOE/PC/80524—T6
FG22-85PC80526	**Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering**	
	12:15286	DOE/PC/80526—T6
FG22-85PC80529	**Brigham Young Univ., Provo, UT (USA). Dept. of Chemical Engineering**	
	12:15303	DOE/PC/80529—T4
FG22-85PC80533	**Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science**	
	12:15304	DOE/PC/80533—T5
FG22-85PC80536	**Grambling State Univ., LA (USA). Dept. of Physics**	
	12:16403	DOE/PC/80536—T5
FG22-85PC80909	**Purdue Univ., West Lafayette, IN**	
	12:16409	Journal of the American Chemical Society 109 NO. 2. 390-402 (21 Jan 1987).
FG22-86PC90529	**Brown Univ., Providence, RI (USA). Div. of Engineering**	
	12:15287	DOE/PC/90529—1
FG22-86PC90957	**University of Southern California, Los Angeles (USA)**	
	12:16474	DOE/PC/90957—T1
NAS-7-100-957031	**Jet Propulsion Lab., Pasadena, CA (USA)**	
	12:15607	DOE/JPL/957031—86-Final
W-31-109-ENG-38	**Argonne National Lab., IL (USA)**	
	12:15272	CONF-860961—6
	12:15323	CONF-860961—5
	USDOE Office of Energy Research, Washington, DC	
	12:15336	CONF-8606161—(Aug 1986).
	12:15342	CONF-8606161—(Aug 1986).
	Health Physics Society, Knoxville, TN (USA). East Tennessee Chapter	
	12:15516	CONF-860203—(Dec 1986).
	Argonne National Lab., IL (USA)	
	12:15869	CONF-861185—3
	12:16017	CONF-861204—5
	12:16019	CONF-8610135—54
	12:16301	Journal of Nuclear Materials 140 NO. 3. 256-263 (Oct 1986).
	12:16327	CONF-860763—5
	12:16412	Journal of the American Chemical Society 109 NO. 1. 90-94 (7 Jan 1987).
	12:16502	ANL-HEP-CP—86-105
	12:16503	ANL-HEP-CP—86-122
	12:16601	CONF-8606241—5
	12:16800	Journal of Bacteriology 168 NO. 3. 1466-1467 (Dec 1986).
	12:16840	Journal of Bacteriology 168 NO. 2. 613-618 (Nov 1986).
	USDOE Office of Energy Research, Washington, DC	
	12:16899	CONF-8606161—(Aug 1986).
	12:16902	CONF-8606161—(Aug 1986).
	Argonne National Lab., IL (USA)	
	12:17095	ANL-HEP-CP—86-133
	12:17124	ANL-HEP-CP—86-134
	12:17257	CONF-8610164—2
W-7405-ENG-26	**Oak Ridge National Lab., TN**	
	12:15345	Radiation Protection Dosimetry 6 NO. 1-4. 137-140 ([1987]).
	Oak Ridge National Lab., TN (USA)	
	12:16154	ORNL—5947
	12:16316	Materials Research Society Symposia Proceedings 27 73-78 (1984).
	12:16343	Journal of Solid State Chemistry 51 1-16 (1984).
	12:16344	Philosophical Magazine, [Part] A: Defects and Mechanical Properties 49 NO. 4. 475-492 (198
	12:16818	Journal of Nuclear Medicine 25 NO. 5. 120 (1984).
W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	12:15440	NUREG/CR—4737
	12:15564	LA—10811-MS
	12:15565	LA-UR—86-4113
	12:15582	LA—10742-MS
	12:16282	LA—10700-MS
	12:16283	LA-UR—86-4347
	12:16284	LA-UR—87-15
	12:16285	LA-UR—87-16
	12:16466	LA-UR—87-83
	12:16491	LA-UR—86-4285
	12:16492	LA-UR—86-4286
	12:16513	LA-UR—86-2243
	12:16528	LA-UR—86-3643
	12:16563	LA-UR—86-3861
	12:16564	LA-UR—86-3863
	12:16647	LA—10815-MS
	12:16648	LA-UR—86-4387
	12:16678	LA-UR—87-78
	12:16918	LA—10859-MS
	12:16963	LA-UR—86-3395
	12:16964	LA-UR—86-4115
	12:16965	LA-UR—86-4116
	12:16966	LA-UR—86-4331
	12:16967	LA-UR—87-38
	12:17160	LA-UR—86-4144
	12:17179	LA-UR—86-4152

Contract No.	Abstract No.	Report No.
	12:17202	LA-UR—86-3786
	12:17298	LA-UR—86-4264
	12:17350	LA-UR—86-3745
	12:17351	LA-UR—86-4187
	12:17352	LA-UR—86-4339
	12:17386	LA-UR—87-22
	12:17411	LA-UR—86-4153
	12:17484	LA-UR—86-3705
W-7405-ENG-48	**Lawrence Livermore National Lab., CA (USA)**	
	12:15373	UCRL—53273-Rev.1
	12:15451	UCRL—53726
	12:16298	UCRL—53753
	12:16299	UCRL—94386
	12:16478	UCRL—53774
	12:16493	UCRL—94402
	12:16683	UCRL—95026-Rev.2
	12:16684	UCRL—95825
	12:16685	UCRL—95155-Rev.1
	12:16698	Computer Vision, Graphics, and Image Processing 33 280-292 (1986).
	12:16879	UCRL—95082
	12:16915	UCRL—53757
	12:16916	UCRL—94676
	12:16928	Geochimica et Cosmochimica Acta 50 NO. 11. 2481-2497 (Nov 1986).
	12:17083	UCRL—95853
	12:17326	UCRL—95946
	12:17417	UCID—17530-87-Rev.6
	Los Alamos National Lab., NM (USA)	
	12:17460	LA—10830-C(Sep 1986).
	12:17462	LA—10830-C(Sep 1986).
	12:17477	LA—10830-C(Sep 1986).
	12:17482	LA—10830-C(Sep 1986).
	Lawrence Livermore National Lab., CA (USA)	
	12:17488	UCRL—52000-86-11
	12:17489	UCRL—95588
	12:17499	Fusion Technology 10 NO. 3. 1079-1087 (Nov 1986).
	12:17513	Fusion Technology 10 NO. 3. 619-623 (Nov 1986).
	12:17534	Fusion Technology 10 NO. 3. 1309-1314 (Nov 1986).
	12:17556	Fusion Technology 10 NO. 3. 649-655 (Nov 1986).
	12:17560	Fusion Technology 10 NO. 3. 679-685 (Nov 1986).
	12:17562	Fusion Technology 10 NO. 3. 695-703 (Nov 1986).
	12:17564	Fusion Technology 10 NO. 3. 1245-1250 (Nov 1986).
	12:17590	Fusion Technology 10 NO. 3. 1557-1564 (Nov 1986).
	12:17606	Fusion Technology 10 NO. 3. 1503-1512 (Nov 1986).
	12:17632	UCRL—95532
	12:17657	UCID—20664-86
	Control Data Corp., Pleasanton, CA (USA)	
	12:17658	UCID—20946
	Lawrence Livermore National Lab., CA (USA)	
	12:17659	UCRL—95652
W-7405-ENG-82	**Iowa State Univ., Ames**	
	12:16817	Biophysical Journal 50 NO. 1. 21-26 (Jul 1986).
	12:17121	Zeitschrift fuer Physik [Sektion] C: Particles and Fields 33 NO. 4. 475-481 (Feb 1987).
W-31109-ENG-38	**Argonne National Lab., IL (USA)**	
	12:15273	CONF-860961—7
	12:15300	CONF-860911—26
	12:15326	CONF-861251—2
	12:15383	CONF-861146—14
	12:15384	CONF-8610156—2
	12:15413	CONF-861207—47
	12:15600	CONF-8609228—1
	12:15601	CONF-8609243—1
	12:15679	CONF-8609154—3
	12:15764	CONF-8610135—55
	12:15765	CONF-8610135—59
	12:15766	CONF-8611120—1
	12:15846	CONF-860906—21
	USDOE, Washington, DC	
	12:15847	CONF-860908—38
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:15848	CONF-860931—9
	Argonne National Lab., IL (USA)	
	12:15849	CONF-860931—15
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:15850	CONF-860931—16
	Westinghouse Research and Development Center, Pittsburgh, PA (USA)	
	12:15851	CONF-861211—22
	Argonne National Lab., IL (USA)	
	12:15965	CONF-860911—27
	12:15973	CONF-860906—22
	12:15974	CONF-860906—23
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:15975	CONF-860908—39
	Saratoga Engineering Consultants, Inc., San Jose, CA (USA)	
	12:15976	CONF-860908—40
	Argonne National Lab., IL (USA)	
	12:15977	CONF-860931—7
	12:15978	CONF-860931—12
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:15979	CONF-860931—13
	Argonne National Lab., IL (USA)	
	12:15980	CONF-861102—33
	12:15981	CONF-861185—6
	12:15982	CONF-861185—7
	12:16014	CONF-860501—17
	12:16015	CONF-860906—19
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:16016	CONF-860931—10
	Argonne National Lab., IL (USA)	
	12:16018	CONF-8610135—51
	Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)	
	12:16020	CONF-8610135—56
	Argonne National Lab., IL (USA)	
	12:16028	EPRI-NP—4924-Vol.2
	12:16148	CONF-861068—15
	12:16149	CONF-8610122—13
	12:16171	CONF-8609236—1
	12:16188	CONF-861008—2
	12:16189	CONF-861008—3
	12:16190	CONF-861008—4
	12:16191	CONF-861008—5
	12:16192	CONF-8609230—1
	12:16200	CONF-861204—4
	12:16234	CONF-8610122—12
	12:16237	ANL/EES-TM—319
	12:16247	CONF-860789—4
	12:16248	CONF-860953—5
	12:16249	CONF-860953—6
	12:16250	CONF-860953—7
	Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering	
	12:16251	CONF-860953—8
	Argonne National Lab., IL (USA)	
	12:16252	CONF-860953—10
	12:16253	CONF-861068—16
	12:16254	CONF-861111—18
	Michigan State Univ., East Lansing (USA). Dept. of Physics	
	12:16255	CONF-861111—19
	Argonne National Lab., IL (USA)	
	12:16256	CONF-861185—2
	12:16257	CONF-861207—43
	12:16259	CONF-861207—48
	12:16260	CONF-861207—49
	12:16261	CONF-861207—50
	12:16262	CONF-861207—51
	12:16263	CONF-861207—52
	12:16328	CONF-860968—4

Contract No.	Abstract No.	Report No.
	Missouri Univ., Kansas City (USA). Dept. of Physics	
	12:16329	CONF-861207—62
	Argonne National Lab., IL (USA)	
	12:16401	CONF-8610159—2
	12:16508	CONF-8611103—6
	12:16538	CONF-860939—2
	12:16539	CONF-861114—39
	12:16540	CONF-861114—40
	12:16541	CONF-861114—53
	12:16542	CONF-8609234—1
	12:16594	ANL-HEP-CP—86-126
	12:16599	CONF-860961—8
	12:16600	CONF-861007—23
	12:16770	ANL/EES-TM—318-Vol.2
	12:16795	CONF-8609239—2
	12:16855	CONF-861123—5
	12:16856	CONF-861123—6
	12:16857	CONF-861123—7
	Kansas State Univ., Manhattan (USA). Dept. of Physics	
	12:17067	CONF-8608108—5
	Argonne National Lab., IL (USA)	
	12:17094	ANL-HEP-CP—86-107
	12:17123	ANL-HEP-CP—86-130
	Argonne National Lab., Idaho Falls, ID (USA)	
	12:17192	CONF-861193—2
	Argonne National Lab., IL (USA)	
	12:17203	CONF-8610239—1
	12:17206	CONF-8610196—5
	12:17242	CONF-8609159—6
	12:17256	CONF-861193—4
	12:17339	CONF-861111—21
	12:17354	CONF-860914—31
	12:17357	CONF-860789—3
	12:17640	ANL—86-51
	12:17643	CONF-8506333—1
	12:17644	CONF-8610218—1

REPORT NUMBER INDEX

The numbers assigned to reports cited in this publication appear in the first column of the index. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index. To expedite the filling of orders for reports from NTIS and OSTI, a file number in the form DE82000001 or TI82000001 appears in column 3. File numbers with DE prefixes may be used in ordering from both NTIS and OSTI. Numbers with TI prefixes are valid at OSTI only. Requesters are urged to use this file number where provided. In column 4, one or more DOE distribution categories are indicated, e.g., STD-10, MN-25. STD indicates distribution was made in full-size copy; MN indicates microcopy distribution; ND indicates no distribution was made. These category numbers are included to assist DOE librarians in responding to requests for reports in their collections. The UC (Unclassified Distribution Categories) are defined in DOE/TIC-4500, available from OSTI. The citation numbers are given in column 5. NOTE: DOE attempts to disseminate its information as broadly as possible. Even though a report may contain some degree of illegibility, it is believed that the report may still make a contribution. The presence of a 1, 2, or 3 following NTIS in the availability column denotes the document quality for microfiche (MF) and printed copy (PC) production: 1 = 92 to 95% legibility, available PC and MF; 2 = 88 to 91% legibility, available MF only; 3 = 87% or less legibility, available PC only. Employees of DOE or DOE contractors are urged to order from the Office of Scientific and Technical Information (OSTI); all others should order from the National Technical Information Service (NTIS).

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
A-				
86184	*See* N-87-11965			12:16443
86276	*See* N-87-13363			12:17035
AD-A-				
173630/ 5/ XAB	NTIS, PC A02/MF A01			12:16345
173730/ 3/ XAB	NTIS, PC A03/MF A01			12:17639
174003/ 4/ XAB	NTIS, PC A07/MF A01			12:16681
174015/ 8/ XAB	NTIS, PC A02/MF A01			12:16486
174034/ 9/ XAB	NTIS, PC A02/MF A01			12:16462
174054/ 7/ XAB	NTIS, PC A02/MF A01			12:16346
174346/ 7/ XAB	NTIS, PC A05/MF A01			12:16156
174521/ 5/ XAB	NTIS, PC A04/MF A01			12:16487
AFIT/GEM/DEM-				
86S-9	*See* AD-A-174346/7/XAB			12:16156
ANL-				
86-51	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005587	STD -32	12:17640
ANL/EES-TM-				
318-Vol.2	NTIS, PC A18/MF A01; 1 (GPO Dep.)	E 1.99: DE87005208	MN -11	12:16770
319	NTIS, PC E04/MF A01 (GPO Dep.)	E 1.99: DE87005645	MN -70	12:16237
ANL-HEP-CP-				
86-105	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004945	MN -28	12:16502
86-107	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87001561	MN -34	12:17094
86-122	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004972	MN -28	12:16503
86-126	NTIS, PC A02; 3	DE87004734	MN -37	12:16594
86-130	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004841	MN -34D	12:17123
86-133	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87004842	MN -34D	12:17095
86-134	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004967	MN -34D	12:17124
AR-				
2	*See* N-87-11892			12:16332
ARB/HS-				
86/ 01	*See* PB-87-109591/XAB			12:16714
86/ 02	*See* PB-87-113221/XAB			12:16722
ARB/SS-				
86/ 03	*See* PB-87-118634/XAB			12:16727
ATR-				
6(9558) -11	NTIS, PC A02/MF A01			12:16935
86(8443) -1	The Aerospace Corporation, El Segundo, CA 90245	TI87900472	MN -25	12:16347
BARC-				
1244	NTIS (US Sales Only), PC A03/MF A01	DE87701244	MN -25	12:16238
1245	NTIS (US Sales Only), PC A03/MF A01	DE87701245	MN -93	12:16184
1246	NTIS (US Sales Only), PC A03/MF A01	DE87701246	MN -34A	12:17086
1250	NTIS (US Sales Only), PC A02/MF A01	DE87701247	MN -80	12:15955
1252	NTIS (US Sales Only), PC A02/MF A01	DE87701248	MN -4	12:16374
1253	NTIS (US Sales Only), PC A07/MF A01	DE87701249	MN -34C	12:17190
1255	NTIS (US Sales Only), PC A04/MF A01	DE87701250	MN -37	12:16593
1256	NTIS (US Sales Only), PC A03/MF A01	DE87701251	MN -28	12:16520
1259	NTIS (US Sales Only), PC A03/MF A01	DE87701252	MN -32	12:17304
1260	NTIS (US Sales Only), PC A03/MF A01	DE87701253	MN -34D	12:17125
1281	NTIS (US Sales Only), PC A02/MF A01	DE87701254	MN -25	12:16348
1288	NTIS (US Sales Only), PC A03/MF A01	DE87701255	MN -78	12:15761
1289	NTIS (US Sales Only), PC A02/MF A01	DE87701256	MN -4	12:16375
1291	NTIS (US Sales Only), PC A05/MF A01	DE87701257	MN -93	12:16185
1293	NTIS (US Sales Only), PC A02/MF A01	DE87701258	MN -46	12:17305
1294	NTIS (US Sales Only), PC A02/MF A01	DE87701259	MN -34A	12:17336
1295	NTIS (US Sales Only), PC A03/MF A01	DE87701260	MN -80	12:15837
1297	NTIS (US Sales Only), PC A04/MF A01	DE87700666	MN -34C	12:17191

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
1298	NTIS (US Sales Only), PC A02/MF A01	DE87701261	MN -78	12:15762
1299	NTIS (US Sales Only), PC A02/MF A01	DE87701262	MN -4	12:16376
1300	NTIS (US Sales Only), PC A02/MF A01	DE87701263	MN -4	12:16377
1301	NTIS (US Sales Only), PC A04/MF A01	DE87701264	MN -34A	12:16438
1302	NTIS (US Sales Only), PC A05/MF A01	DE87701265	MN -4	12:16399
1303	NTIS (US Sales Only), PC A06/MF A01	DE87701266	MN -23	12:17329
1304	NTIS (US Sales Only), PC A02/MF A01	DE87701267	MN -4	12:16378
1305	NTIS (US Sales Only), PC A03/MF A01	DE87701268	MN -38	12:16439
1306	NTIS (US Sales Only), PC A02/MF A01	DE87701269	MN -4	12:16379
1307	NTIS (US Sales Only), PC A02/MF A01	DE87701270	MN -4	12:16380
1310	NTIS (US Sales Only), PC A02/MF A01	DE87701271	MN -4	12:16381
BG-Trans-				
15029	NTIS (US Sales Only), PC A02/MF A01; 1	DE87900509	MN -41	12:16883
BM-IC-				
9078	*See* PB-87-113171/XAB			12:15322
BMFT-FB-T-				
86-083	NTIS (US Sales Only), PC A03/MF A01	DE87751298	MN -61A	12:15584
86-087	NTIS (US Sales Only), PC A16/MF A01; 1	DE87751310	MN -62	12:15618
86-109	NTIS (US Sales Only), PC A05/MF A01; 1	DE87751300	MN -90	12:16239
BMI/ONWI-				
617	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE87005576	STD -70	12:15487
629	NTIS, PC A04/MF A01; 1	DE87005194	STD -70	12:15407
630	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87005580	STD -70	12:16924
631	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87005487	STD -70	12:16925
BNL-				
38267	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87005246	MN -90a	12:15269
38491	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86015078	MN -34C	12:17239
38848	NTIS, PC A02/MF A01; 1	DE87003197	MN -48	12:16794
38870	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003203	MN -48	12:15598
38938	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005251	MN -28	12:16533
38963	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005250	MN -34A	12:17058
38969	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005261	MN -48	12:16884
39052	NTIS, PC A02; 3	DE87005248	MN -25	12:16240
39054	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004246	MN -34A	12:17337
39057	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87005256	MN -28	12:16571
39062	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004612	MN -34D	12:17126
39087	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005391	MN -92	12:15587
39088	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005390	MN -92	12:15588
39089	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005389	MN -92	12:15589
39096	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004606	MN -25	12:16241
39104	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005252	MN -48	12:16595
39105	NTIS, PC A02; 3	DE87005244	MN -28	12:16534
39109	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005243	MN -28	12:16535
39110	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005255	MN -13	12:16158
39168	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005257	MN -34D	12:17096
39169	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005254	MN -48	12:16885
52049	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE87005585	STD -94d	12:16242
BNL-NCS-				
38907	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004605	MN -34C	12:17216
BNL-NUREG-				
39007	NTIS, PC A02/MF A01	TI87004171	MN -70B	12:15408
39048	NTIS, PC A02/MF A01 - GPO (GPO Dep.)	E 1.99: TI87004603	MN -78	12:16004
39156	NTIS, PC A02/MF A01 - GPO	TI87005242	MN -78	12:16005
39157	NTIS, PC A02/MF A01 - GPO	TI87005245	MN -78	12:16006
52019	*See* NUREG/CR-4730	TI87005636	MN -70B	12:15439
BRE-IP-				
14/ 86	Publications Sales Office, Building Research Establishment, Garston, Watford WD2 7JR		ND -95d	12:16199
CALT-				
68-1404	*See* DOE/ER/25009-290B	E 1.99: DE87005035	MN -32	12:17645
68-1409	*See* DOE/ER/25009-371	E 1.99: DE87005033	MN -34D	12:17343
68-1411	*See* SLAC-PUB-4144	DE87004559	MN -34D	12:17155
CEA-CONF-				
8318	NTIS (US Sales Only), PC A02/MF A01	DE87750439	MN -34C	12:17253
8340	NTIS (US Sales Only), PC A02/MF A01	DE87750575	MN -34A	12:17059
8343	NTIS (US Sales Only), PC A03/MF A01	DE87750441	MN -78	12:16007
8348	NTIS (US Sales Only), PC A04/MF A01	DE87750442	MN -78	12:16008
8370	NTIS (US Sales Only), PC A02/MF A01	DE87750471	MN -86	12:15379
8400	NTIS (US Sales Only), PC A02/MF A01	DE87750559	MN -80	12:16596
8406	NTIS (US Sales Only), PC A02/MF A01	DE87750440	MN -70	12:15409
8421	NTIS (US Sales Only), PC A03/MF A01	DE87750560	MN -20e	12:17425
8439	NTIS (US Sales Only), PC A02/MF A01	DE87750475	MN -34C	12:17240
8440	NTIS (US Sales Only), PC A02/MF A01	DE87750448	MN -34C	12:17241
8454	NTIS (US Sales Only), PC A02/MF A01	DE87750444	MN -34A	12:17060
8455	CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92, France. Inst. de Recherche Technologique et de Developpement Industriel (IRDI)		ND -25	12:16428
8460	NTIS (US Sales Only), PC A02/MF A01	DE87750446	MN -34B	12:16940
8461	NTIS (US Sales Only), PC A03/MF A01	DE87750445	MN -37	12:16670
8466	NTIS (US Sales Only), PC A02/MF A01	DE87750574	MN -34D	12:17127
8468	NTIS (US Sales Only), PC A02/MF A01	DE87750449	MN -34C	12:17208
8483	NTIS (US Sales Only), PC A02/MF A01	DE87750572	MN -25	12:16243
8487	NTIS (US Sales Only), PC A02/MF A01	DE87750556	MN -70	12:15410
8489	NTIS (US Sales Only), PC A03/MF A01	DE87750565	MN -20g	12:17396

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
8492	NTIS (US Sales Only), PC A02/MF A01	DE87750457	MN -20f	12:17397
8494	NTIS (US Sales Only), PC A02/MF A01	DE87750573	MN -34A	12:17061
8496	NTIS (US Sales Only), PC A02/MF A01	DE87750566	MN -20f	12:17398
8497	NTIS (US Sales Only), PC A02/MF A01	DE87750458	MN -34	12:16463
8498	NTIS (US Sales Only), PC A02/MF A01	DE87750459	MN -34	12:16464
8503	NTIS (US Sales Only), PC A02/MF A01	DE87750589	MN -34C	12:17227
8506	NTIS (US Sales Only), PC A02/MF A01	DE87750558	MN -70	12:15411
8511	NTIS (US Sales Only), PC A03/MF A01	DE87750570	MN -20d	12:17426
8512	NTIS (US Sales Only), PC A03/MF A01	DE87750563	MN -20g	12:17399
8513	NTIS (US Sales Only), PC A03/MF A01	DE87750578	MN -34D	12:17158
8514	NTIS (US Sales Only), PC A02/MF A01	DE87750564	MN -34	12:17356
8516	NTIS (US Sales Only), PC A02/MF A01	DE87750569	MN -20d	12:17427
8517	NTIS (US Sales Only), PC A02/MF A01	DE87750568	MN -20d	12:17428
8519	NTIS (US Sales Only), PC A02/MF A01	DE87750472	MN -4	12:16400
8520	NTIS (US Sales Only), PC A02/MF A01	DE87750455	MN -4	12:16427
8523	NTIS (US Sales Only), PC A02/MF A01	DE87750567	MN -20d	12:17429
8524	NTIS (US Sales Only), PC A02/MF A01	DE87750470	MN -86	12:15380
8529	NTIS (US Sales Only), PC A02/MF A01	DE87750466	MN -28	12:16507
8530	NTIS (US Sales Only), PC A02/MF A01	DE87750456	MN -34A	12:17062
8531	NTIS (US Sales Only), PC A02/MF A01	DE87750460	MN -28	12:16536
8537	NTIS (US Sales Only), PC A02/MF A01	DE87750464	MN -25	12:16325
8538	NTIS (US Sales Only), PC A02/MF A01	DE87750465	MN -25	12:16326
8540	NTIS (US Sales Only), PC A02/MF A01	DE87750467	MN -25	12:16349
8542	NTIS (US Sales Only), PC A02/MF A01	DE87750463	MN -34C	12:17204
8546	NTIS (US Sales Only), PC A02/MF A01	DE87750469	MN -34C	12:17205
8547	NTIS (US Sales Only), PC A02/MF A01	DE87750468	MN -34C	12:17233
8553	NTIS (US Sales Only), PC A02/MF A01	DE87750557	MN -79b	12:16244
8555	NTIS (US Sales Only), PC A02/MF A01	DE87750576	MN -34A	12:17063
8556	NTIS (US Sales Only), PC A02/MF A01	DE87750577	MN -34A	12:17064
8557	NTIS (US Sales Only), PC A02/MF A01	DE87750461	MN -21	12:17430
8558	NTIS (US Sales Only), PC A02/MF A01	DE87750587	MN -25	12:16350
8562	NTIS (US Sales Only), PC A02/MF A01	DE87750473	MN -25	12:16245
8563	NTIS (US Sales Only), PC A02/MF A01	DE87750474	MN -25	12:16246
8564	NTIS (US Sales Only), PC A02/MF A01	DE87750571	MN -20d	12:17431
CEA-DAS-				
219	NTIS (US Sales Only), PC A02/MF A01	DE87750554	MN -71	12:15489
CEA-DPH-N-S-				
2344	*See* CEA-CONF-8439	DE87750475	MN -34C	12:17240
2347	*See* CEA-CONF-8440	DE87750448	MN -34C	12:17241
2351-3	*See* CEA-CONF-8529	DE87750466	MN -28	12:16507
2352	*See* CEA-CONF-8468	DE87750449	MN -34C	12:17208
2355	*See* CEA-CONF-8503	DE87750589	MN -34C	12:17227
2364	*See* CEA-CONF-8542	DE87750463	MN -34C	12:17204
CEA-N-				
2479	NTIS (US Sales Only), PC A08/MF A01	DE87750537	MN -34D	12:17128
CEA-R-				
5359	NTIS (US Sales Only), PC A05/MF A01	DE87750538	MN -25	12:16465
CENBG-				
8528	NTIS (US Sales Only), PC A02/MF A01	DE87750451	MN -34C	12:17228
8602	NTIS (US Sales Only), PC A02/MF A01	DE87750452	MN -34C	12:17234
CENBG-R-				
8601	NTIS (US Sales Only), PC A02/MF A01	DE87750476	MN -34C	12:17217
CERN-				
86-06	NTIS (US Sales Only), PC A04/MF A01	DE87700667	MN -28	12:16590
86-07	NTIS (US Sales Only), PC A02/MF A01	DE87700668	MN -34D	12:17097
CMP-				
002	Oak Ridge Associated Universities, Inc., TN (USA)			12:16700
CNEN-NE-				
6.05	Centro de Informacoes Nucleares, Comissao Nacional de Energia Nuclear, RJ, Brazil		ND -70	12:15412
CNIC-				
00002	NTIS (US Sales Only), PC A02/MF A01	DE87701272	MN -86	12:15381
00003	NTIS (US Sales Only), PC A02/MF A01	DE87701273	MN -86	12:15382
00004	NTIS (US Sales Only), PC A02/MF A01	DE87701274	MN -4	12:16382
00005	NTIS (US Sales Only), PC A02/MF A01	DE87701275	MN -28	12:16537
00006	NTIS (US Sales Only), PC A02/MF A01	DE87701276	MN -34C	12:17254
00007	NTIS (US Sales Only), PC A02/MF A01	DE87701277	MN -32	12:17255
00008	NTIS (US Sales Only), PC A02/MF A01	DE87701278	MN -4	12:16383
00009	NTIS (US Sales Only), PC A02/MF A01	DE87701279	MN -28	12:16521
00010	NTIS (US Sales Only), PC A02/MF A01	DE87701280	MN -37	12:16597
CONF-8310105-	(Joint meeting of the Basic Science and Nuclear Divisions of the American Ceramic Society, Columbus, OH, USA, 30 Oct-2 Nov 1983)			
2	American Ceramic Society	TI87003342	ND -25	12:16330
CONF-8310436-	(6. annual ORNL life science symposium, Knoxville, TN, USA, 31 Oct-2 Nov 1983)			
	Springer-Verlag, 175 Fifth Avenue, New York, NY 10010			12:16741
CONF-8311295-	(RELAP TRAC seminar, Fontenay-aux-Roses, France, 15 Nov 1983)			
6	*See* CEA-CONF-8343	DE87750441	MN -78	12:16007
7	*See* CEA-CONF-8348	DE87750442	MN -78	12:16008

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
CONF-8311300-	(Symposium on total research on long life radioactive waste management, Tokyo, Japan, 25 Nov 1983, 25 Nov 1983)			
Summs.	*See* UTRCN-S-8	DE87701241	MN -70	12:15452
CONF-840299-	(Winter school on fundamental nuclear physics, Trieste, Italy, 7 Feb-30 Mar 1984)			
5	*See* ISN-84-47	DE87750443	MN -34C	12:17286
CONF-8404323-	(Symposium on recent experiences in multidisciplinary analysis and optimization, Hampton, VA, USA, 24-26 Apr 1984)			
Pt.1	*See* N-87-11717			12:16437
CONF-840619-	(31. annual meeting of the Society of Nuclear Medicine, Los Angeles, CA, USA, 5-8 Jun 1984)			
	J. Nucl. Med., 25: No. 5, 120(1984)			12:16818
	J. Nucl. Med., 25: No. 5, 105(1984)			12:16819
	J. Nucl. Med., 25: No. 5, 105(1984)			12:16820
	J. Nucl. Med., 25: No. 5, 87(1984)			12:16821
	J. Nucl. Med., 25: No. 5, 89(1984)			12:16822
	J. Nucl. Med., 25: No. 5, 111(1984)			12:16823
	J. Nucl. Med., 25: No. 5, 110(1984)			12:16824
CONF-840757-	(22. international conference on high energy physics, Leipzig, German D.R., 19-25 Jul 1984)			
39	*See* NBI-HE-84-42	DE87750534	MN -34D	12:17119
CONF-840760-	(Ion beam modification of materials conference, Ithaca, NY, USA, 16-20 Jul 1984)			
22	*See* LYCEN-8445	DE87750581	MN -25	12:16286
CONF-840786-	(9. international conference on atomic physics, Seattle, WA, USA, 23-27 Jul 1984)			
	World Scientific Publishing Co. Pte. Ltd., P.O. Box 128, Farrer Road, Singapore 9128	TI87004225		12:17085
CONF-840851-	(2. IMACS symposium on energy modeling and simulation, Upton, NY, USA, 26-29 Aug 1984)			
5	NTIS, PC A02; 3	DE87004896	MN -11	12:16701
CONF-8408138-	(6. general conference of the European Physical Society, Prague, Czechoslovakia, 27-31 Aug 1984)			
Vol.1	*See* INIS-mf-10556-Vol.1	DE87700737	MN -34B	12:16944
Vol.2	*See* INIS-mf-10556-Vol.2	DE87700738	MN -34D	12:17140
CONF-8408212-	(9. European cosmic ray symposium, Kosice, Czechoslovakia, 20-25 Aug 1984)			
1	*See* KFKI-1986-41/C	DE87700821	MN -34B	12:16962
CONF-8410299-	(4. European meeting on solar physics, Noordwijkerhout, Netherlands, 1-3 Oct 1984)			
1	*See* NORDITA-84/44-Prepr.	DE87750527	MN -34B	12:17044
CONF-8410462-	(4. seminar on safety and operating reliability of the WWER reactor, Zelezna Ruda, Czechoslovakia, 17-18 Oct 1984)			
	See INIS-mf-10555	DE87700736	MN -51	12:16038
CONF-8411284-	(Seminar on application of ionizing radiation in food and feeds processing, Prague, Czechoslovakia, 1 Nov 1984, 1 Nov 1984)			
	See INIS-mf-10552	DE87700732	MN -23	12:16844
CONF-8411288-	(DPF meeting, Santa Fe, NM, USA, 1 Nov 1984, 1 Nov 1984)			
1	*See* NUB-2663	E 1.99: DE87002875	MN -34D	12:17182
CONF-8412124-	(Experts discussion on a waste management concept for the south western and southern Palatinate, Pirmasens, F.R. Germany, 10 Dec 1984, 10 Dec 1984)			
Exc.	NTIS (US Sales Only), PC A03; 3	DE87751306	MN -95e	12:16225
CONF-850173-	(23. international winter meeting on nuclear physics, Bormio, Italy, 21-26 Jan 1985)			
17	*See* CENBG-R-8601	DE87750476	MN -34C	12:17217
CONF-8501103-	(Specialist research meeting on measurements of short-lived isotopes, Kyoto, Japan, 9-10 Jan 1985)			
Summs.	*See* KURRI-TR-266	DE87701222	MN -37	12:16646
CONF-8501104-	(Study meeting on nuclear fission-nuclear fusion hybrid reactor, Tokai, Ibaraki, Japan, 11 Jan 1985, 11 Jan 1985)			
Summs.	*See* UTNL-R-0176	DE87701240	MN -20	12:17490
CONF-8503268-	(Workshop on spectrometry and in core dosimetry of neutron radiation, Rez, Czechoslovakia, 20-21 Mar 1985)			
Pt.1	*See* INIS-mf-10554	DE87700735	MN -37	12:16619
CONF-8503273-	(ISH '85: symposium on short-distance heat within the international trade fair sanitation-heating-air conditioning, Frankfurt am Main, F.R. Germany, 22 Mar 1985, 22 Mar 1985)			
Summ.	NTIS (US Sales Only), MF A01; 2	DE87751305	MN -95	12:15670
CONF-850484-	(Penetration phenomena workshop, Oak Ridge, TN, USA, 14-16 Apr 1985)			
	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE87002878	MN -34A	12:17338
CONF-8504286-	(Consultants' meeting on the technology and use of low power research reactors, Beijing, China, 30 Apr-3 May 1985)			
	See IAEA-TECDOC-384	DE87700708	MN -80	12:15985

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-850522-	(5. annual contractors' review meeting on contaminant control in hot coal derived gas streams, Morgantown, WV, USA, 7-9 May 1985)			
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003951	MN -90c	12:15270
CONF-8505112-	(2. international symposium on the biology and toxicology of metals using nuclear analytical methods, Upton, NY, USA, 20-22 May 1985)			
9	*See* BNL-38969	E 1.99: DE87005261	MN -48	12:16884
CONF-8505333-	(3. seminar group theoretical methods in physics, Jurmala, USSR, 22-24 May 1985)			
1	*See* JINR-E-2-85-930	DE87700782	MN -34D	12:17373
CONF-850635-	(4. international symposium on neutron induced reactions, Smolenice, Czechoslovakia, 17-21 Jun 1985)			
Absts.	*See* INIS-mf-10558	DE87700739	MN -34C	12:17264
CONF-8506120-	(4. international conference on nuclear reaction mechanisms, Varenna, Italy, 10-15 Jun 1985)			
3	*See* CENBG-8528	DE87750451	MN -34C	12:17228
CONF-8506162-	(Symposium on medium energy nucleon and antinucleon scattering, Bad Honnef, F.R. Germany, 18-21 Jun 1985)			
5	*See* DOE/ER/03244-134	DE87003929	MN -34C	12:17098
CONF-8506326-	(Conference on swine in biomedical research, Columbia, MO, USA, 17-20 Jun 1985)			
	Plenum Publishing Corp., New York, N.Y.			12:16793
CONF-8506333-	(IFIP WG 2.5 working conference on problem solving environments for scientific computing, Sophia Antipolis, France, 17-21 Jun 1985)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87001558	MN -32	12:17643
CONF-850768-	(SLAC summer institute on particle physics, Stanford, CA, USA, 29 Jul-9 Aug 1985)			
12	*See* BNL-39057	E 1.99: DE87005256	MN -28	12:16571
CONF-850834-	(WINDPOWER '85, San Francisco, CA, USA, 27-30 Aug 1985)			
	American Wind Energy Assoc., 1516 King St., Alexandria, VA Alexandria, VA			12:15632
CONF-8508107-	(International seminar on solute defect interaction: theory and experiment, Kingston, Ontario, Canada, 5-9 Aug 1985)			
3	NTIS, PC A02/MF A01; 1	DE87003666	MN -25	12:17341
CONF-850931-	(International seminar on costs and financing of nuclear power plants in developing countries, Vienna, Austria, 9-12 Sep 1985)			
	See IAEA-TECDOC-378	DE87700707	MN -2	12:15881
CONF-850944-	(Muskoka conference: international symposium on acidic precipitation, Toronto, Ontario, Canada, 15-20 Sep 1985)			
	Water, Air, Soil Pollut., 30: No. 1-2, 75-90(Sep 1986)			12:16731
	Water, Air, Soil Pollut., 30: No. 1-2, 143-152(Sep 1986)			12:16732
	Water, Air, Soil Pollut., 30: No. 1-2, 331-345(Sep 1986)			12:16733
CONF-8509177-	(24. colloquium spectroscopicum internationale, Garmisch-Partenkirchen, F.R. Germany, 23 Sep 1985, 23 Sep 1985)			
	See Juel-Conf-55	DE87751308	MN -4	12:16390
CONF-8509330-	(CERN accelerator school, Oxford, UK, 16-27 Sep 1985)			
4	*See* LAL-RT-85-16	DE87750450	MN -28	12:16529
CONF-8509366-	(IAEA general conference on small and medium power reactors, Vienna, Austria, 25-26 Sep 1985)			
	See IAEA-TECDOC-376	DE87700889	MN -2	12:15871
CONF-8509370-	(Joint conference of IUFRO working parties on forest gall midges and rusts of pines, Seoul, Korea, 16-21 Sep 1985)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003912	MN -48	12:16886
CONF-851003-	(Conference on coal science, Sydney, Australia, 28 Oct-1 Nov 1985)			
	Pergamon Press, 19a Boundary St., Rushcutters Bay, N.S.W., 2011 Australia	TI87004322	ND -90	12:15267
CONF-8510160-	(ASM metals congress/TMS-AIME fall meeting, Toronto, Ontario, Canada, 13-18 Oct 1985)			
21	*See* HEDL-SA-3280-FP	DE87004091	MN -25	12:16277
CONF-8510308-	(Gas sampling calorimetry workshop, Batavia, IL, USA, 31 Oct-1 Nov 1985)			
3	*See* FNAL-TM-1434	E 1.99: DE87005561	STD -28	12:16611
CONF-851115-	(American Nuclear Society winter meeting, San Francisco, CA, USA, 10-15 Nov 1985)			
52	*See* HEDL-SA-3336-FP	E 1.99: DE87005456	MN -79	12:15853
CONF-851128-	(17. European conference on laser interaction with matter, Rome, Italy, 18-22 Nov 1985)			
4	*See* CEA-CONF-8489	DE87750565	MN -20g	12:17396

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
CONF-851157-	(Specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV, Paris, France, 13-15 Nov 1985)			
1	*See* CEA-CONF-8318	DE87750439	MN -34C	12:17253
CONF-8511235-	(Seminar on new dose quantities for personnel dosemeters - results of the intercomparison program 1985, Braunschweig, F.R. Germany, 26-27 Nov 1985)			
	See PTB-Dos-14	DE87750519	MN -41	12:16649
CONF-8511237-	(266. R.C.P. meeting on inverse problems, Montpellier, France, 27-30 Nov 1985)			
1	*See* CEA-CONF-8340	DE87750575	MN -34A	12:17059
CONF-860148-	(2. United States/Mexico cooperative symposium on atomic and molecular physics, Cocoyoc, Mexico, 8-11 Jan 1986)			
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87003001	MN -34A	12:17065
CONF-860158-	(25. international meeting on nuclear physics, Bormio, Italy, 20-25 Jan 1986)			
6	*See* CENBG-8602	DE87750452	MN -34C	12:17234
CONF-860160-	(14. international workshop on the gross properties of nuclei and nuclear excitation, Hirschegg, Austria, 13-18 Jan 1986)			
2	*See* GANIL-P-86-02	DE87750584	MN -34C	12:17219
CONF-860167-	(Recontres de Moriond workshop on massive neutrinos in particle physics and astrophysics, Tignes, Savoie, France, 25 Jan-1 Feb 1986)			
7	*See* CEA-CONF-8400	DE87750559	MN -80	12:16596
CONF-8601103-	(2. joint seminar on heavy-ion nuclear physics and nuclear chemistry in the energy region of tandem accelerators, Tokai, Ibaraki, Japan, 9-11 Jan 1986)			
	See JAERI-M-86-067	DE87701064	MN -34C	12:17200
CONF-860272-	(Wire chamber conference, Vienna, Austria, 25-28 Feb 1986)			
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 239-245(1 Dec 1986)			12:16652
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 343-349(1 Dec 1986)			12:16653
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 458-460(1 Dec 1986)			12:16654
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 478-482(1 Dec 1986)			12:16655
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 547-563(1 Dec 1986)			12:16656
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 263-266(1 Dec 1986)			12:16657
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 295-298(1 Dec 1986)			12:16658
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 350-356(1 Dec 1986)			12:16659
	Nucl. Instrum. Methods Phys. Res., 252: No. 2/3, 471-477(1 Dec 1986)			12:16660
CONF-860311-	(Nuclear power plant maintenance meeting, Salt Lake City, UT, USA, 23-27 Mar 1986)			
11	*See* HEDL-SA-3363-FP	DE87004087	MN -79	12:15983
CONF-860324-	(High temperature plasma diagnostics, Hilton Head Island, SC, USA, 9-13 Mar 1986)			
33	*See* CEA-CONF-8492	DE87750457	MN -20f	12:17397
CONF-860333-	(General meeting of the American Physical Society, Las Vegas, NV, USA, 31 Mar-4 Apr 1986)			
2	*See* N-87-11893			12:16360
CONF-860396-	(Symposium on the many facets of heavy ion fusion reactions, Argonne, IL, USA, 24-26 Mar 1986)			
15	*See* CEA-CONF-8439	DE87750475	MN -34C	12:17240
16	*See* GANIL-P-86-09	DE87750583	MN -34C	12:17243
CONF-8603119-	(21. Rencontre de Moriond: strong interactions and gauge theories conference, Les Arcs, France, 16-22 Mar 1986)			
14	*See* CEA-CONF-8466	DE87750574	MN -34D	12:17127
CONF-8603159-	(Meeting on protection, handling, detection and safety, Grenoble, France, 12-14 Mar 1986)			
1	*See* CEA-CONF-8406	DE87750440	MN -70	12:15409
CONF-860405-	(10. annual symposium on energy from biomass and wastes, Washington, DC, USA, 7-10 Apr 1986)			
7	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87004018	MN -61F	12:15599
CONF-860435-	(Atomic and molecular physics conference, Aberdeen, Scotland, 8-10 Apr 1986)			
1	*See* CEA-CONF-8494	DE87750573	MN -34A	12:17061
CONF-8604123-	(67. annual American Welding Society meeting, Atlanta, GA, USA, 13-18 Apr 1986)			
3	*See* RFP-4060	E 1.99: DE87005044	MN -25	12:16295
CONF-8604202-	(7. workshop on grand unification, Toyama City, Japan, 16-18 Apr 1986)			
3	*See* LBL-22277	DE87002562	MN -34D	12:17180

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-8604218-	(American Gas Association: distribution/transmission conference, Chicago, IL, USA, 28-30 Apr 1986)			
7	Institute of Gas Technology, 3424 South State Street, Chicago, IL 60616	TI87900441	MN -92	12:15368
CONF-8604222-	(70. annual meeting of the Federation of American Society for Experimental Biology, St. Louis, MO, USA, 13-18 Apr 1986)			
	Fed. Proc., Fed. Am. Soc. Exp. Biol., 45: No. 4, 1086(5 Mar 1986)			12:16907
CONF-8604224-	(International colloquium on X-ray lasers, Aussois, France, 14-17 Apr 1986)			
3	*See* CEA-CONF-8454	DE87750444	MN -34A	12:17060
4	*See* CEA-CONF-8497	DE87750458	MN -34	12:16463
5	*See* CEA-CONF-8498	DE87750459	MN -34	12:16464
6	*See* CEA-CONF-8496	DE87750566	MN -20f	12:17398
CONF-8604262-	(16. meeting on actinides, Eibsee, F.R. Germany, 28-30 Apr 1986)			
2-Summ.	*See* CEA-CONF-8455		ND -25	12:16428
CONF-8604266-	(Tritium meeting, Dijon, France, 23-25 Apr 1986)			
2	*See* CEA-CONF-8487	DE87750556	MN -70	12:15410
3	*See* CEA-CONF-8421	DE87750560	MN -20e	12:17425
CONF-8604273-	(International spring school on space environment technology, Toulouse, France, 14-18 Apr 1986)			
1	*See* CEA-CONF-8460	DE87750446	MN -34B	12:16940
CONF-8604292-	(Society of Photo-Optical Instrumentation advanced institute on broadband photonic sensors, Howey-in-the-Hills, FL, USA, 7-11 Apr 1986)			
1	*See* UCRL-94402	E 1.99: DE87003160	MN -37	12:16493
CONF-8604294-	(International seminar quark, Tbilisi, USSR, 1 Apr 1986, 1 Apr 1986)			
1	*See* JINR-R-2-86-147	DE87701145	MN -34D	12:17148
CONF-860501-	(Conference on the science and technology of fast reactor safety, Channel Islands, UK, 12-16 May 1986)			
17	NTIS, PC A02; 3	DE87001570	MN -79p	12:16014
CONF-860506-	(International conference on heavy ion nuclear collisions in the Fermi energy domain, Caen, France, 12-16 May 1986)			
8	*See* CEA-CONF-8440	DE87750448	MN -34C	12:17241
9	*See* CEA-CONF-8468	DE87750449	MN -34C	12:17208
10	*See* CEA-CONF-8503	DE87750589	MN -34C	12:17227
CONF-860551-	(Technical meeting and workshop on fusion reactor design and technology, Yalta, USSR, 26 May-6 Jun 1986)			
11	*See* CEA-CONF-8511	DE87750570	MN -20d	12:17426
CONF-8605110-	(OPTO '86 conference, Paris, France, 13-15 May 1986)			
4	*See* CEA-CONF-8461	DE87750445	MN -37	12:16670
CONF-8605150-	(Beijing symposium on physics at tandem, Beijing, China, 26-30 May 1986)			
3	NTIS, PC A02; 3	DE87005498	MN -34C	12:17235
CONF-8605205-	(Colloquium on hydrology and radiology, Limoges, France, 21 May 1986)			
1	*See* CEA-CONF-8506	DE87750558	MN -70	12:15411
CONF-8605206-	(National congress on numerical analysis, Port Barcares, France, 26-30 May 1986)			
1	*See* CEA-CONF-8512	DE87750563	MN -20g	12:17399
2	*See* CEA-CONF-8514	DE87750564	MN -34	12:17356
CONF-8605207-	(9. Sitges conference, Sitges, Spain, 26-30 May 1986)			
1	*See* CEA-CONF-8513	DE87750578	MN -34D	12:17158
CONF-8605223-	(11. annual conference on clean liquid and solid fuels, Palo Alto, CA, USA, 7 May 1986,-9 May 1996)			
1	*See* BNL-39088	E 1.99: DE87005390	MN -92	12:15588
CONF-860603-	(4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair, Geneva, Switzerland, 1-6 Jun 1986)			
11	*See* CEA-CONF-8524	DE87750470	MN -86	12:15380
12	*See* CEA-CONF-8370	DE87750471	MN -86	12:15379
13	*See* CEA-CONF-8517	DE87750568	MN -20d	12:17428
14	*See* CEA-CONF-8516	DE87750569	MN -20d	12:17427
CONF-860605-	(13. international symposium on the effects of radiation on materials, Seattle, WA, USA, 23-25 Jun 1986)			
35	*See* CEA-CONF-8523	DE87750567	MN -20d	12:17429
CONF-860608-	(World congress on high tech ceramics: electronic, engineering, nuclear, biomedical research and applications in focus, Milan, Italy, 23-27 Jun 1986)			
9	*See* CEA-CONF-8537	DE87750464	MN -25	12:16325
10	*See* CEA-CONF-8538	DE87750465	MN -25	12:16326
CONF-860610-	(American Nuclear Society annual meeting, Reno, NV, USA, 15-20 Jun 1986)			
34	*See* BNL-38491	E 1.99: DE86015078	MN -34C	12:17239
CONF-860616-	(International symposium on intense dynamic loading and its effects, Beijing, China, 3-7 Jun 1986)			
11	*See* CEA-CONF-8483	DE87750572	MN -25	12:16243

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
CONF-860620-	(Society of Photo-Optical Instrumentation Engineers international symposium: topics in optical and optoelectronic applied sciences and engineering, Quebec City, Canada, 2-6 Jun 1986)			
11	*See* CEA-CONF-8519	DE87750472	MN -4	12:16400
CONF-860629-	(Linear accelerator conference, Stanford, CA, USA, 2-6 Jun 1986)			
61	*See* CEA-CONF-8529	DE87750466	MN -28	12:16507
68	*See* LA-UR-86-3643	DE87005132	MN -28	12:16528
CONF-860652-	(7. topical meeting on the technology of fusion energy, Reno, NV, USA, 15-19 Jun 1986)			
	Fusion Technol., 10: No. 3, 1177-1184(Nov 1986)			12:17418
	Fusion Technol., 10: No. 3, 1171-1176(Nov 1986)			12:17419
	Fusion Technol., 10: No. 3, 481-490(Nov 1986)			12:17492
	Fusion Technol., 10: No. 3, 491-497(Nov 1986)			12:17493
	Fusion Technol., 10: No. 3, 508-513(Nov 1986)			12:17494
	Fusion Technol., 10: No. 3, 704-708(Nov 1986)			12:17495
	Fusion Technol., 10: No. 3, 709-718(Nov 1986)			12:17496
	Fusion Technol., 10: No. 3, 875-880(Nov 1986)			12:17497
	Fusion Technol., 10: No. 3, 890-895(Nov 1986)			12:17498
	Fusion Technol., 10: No. 3, 1079-1087(Nov 1986)			12:17499
	Fusion Technol., 10: No. 3, 1117-1122(Nov 1986)			12:17500
	Fusion Technol., 10: No. 3, 1146-1152(Nov 1986)			12:17501
	Fusion Technol., 10: No. 3, 1153-1158(Nov 1986)			12:17502
	Fusion Technol., 10: No. 3, 1159-1164(Nov 1986)			12:17503
	Fusion Technol., 10: No. 3, 1165-1170(Nov 1986)			12:17504
	Fusion Technol., 10: No. 3, 1279-1289(Nov 1986)			12:17505
	Fusion Technol., 10: No. 3, 1290-1296(Nov 1986)			12:17506
	Fusion Technol., 10: No. 3, 514-520(Nov 1986)			12:17507
	Fusion Technol., 10: No. 3, 541-548(Nov 1986)			12:17508
	Fusion Technol., 10: No. 3, 549-563(Nov 1986)			12:17509
	Fusion Technol., 10: No. 3, 599-608(Nov 1986)			12:17510
	Fusion Technol., 10: No. 3, 609-614(Nov 1986)			12:17511
	Fusion Technol., 10: No. 3, 615-618(Nov 1986)			12:17512
	Fusion Technol., 10: No. 3, 619-623(Nov 1986)			12:17513
	Fusion Technol., 10: No. 3, 624-632(Nov 1986)			12:17514
	Fusion Technol., 10: No. 3, 633-640(Nov 1986)			12:17515
	Fusion Technol., 10: No. 3, 641-648(Nov 1986)			12:17516
	Fusion Technol., 10: No. 3, 770-775(Nov 1986)			12:17517
	Fusion Technol., 10: No. 3, 813-821(Nov 1986)			12:17518
	Fusion Technol., 10: No. 3, 837-847(Nov 1986)			12:17519
	Fusion Technol., 10: No. 3, 848-853(Nov 1986)			12:17520
	Fusion Technol., 10: No. 3, 854-859(Nov 1986)			12:17521
	Fusion Technol., 10: No. 3, 860-865(Nov 1986)			12:17522
	Fusion Technol., 10: No. 3, 925-930(Nov 1986)			12:17523
	Fusion Technol., 10: No. 3, 952-957(Nov 1986)			12:17524
	Fusion Technol., 10: No. 3, 958-961(Nov 1986)			12:17525
	Fusion Technol., 10: No. 3, 962-971(Nov 1986)			12:17526
	Fusion Technol., 10: No. 3, 972-977(Nov 1986)			12:17527
	Fusion Technol., 10: No. 3, 1053-1058(Nov 1986)			12:17528
	Fusion Technol., 10: No. 3, 1065-1078(Nov 1986)			12:17529
	Fusion Technol., 10: No. 3, 1088-1096(Nov 1986)			12:17530
	Fusion Technol., 10: No. 3, 1097-1101(Nov 1986)			12:17531
	Fusion Technol., 10: No. 3, 1123-1132(Nov 1986)			12:17532
	Fusion Technol., 10: No. 3, 1133-1145(Nov 1986)			12:17533
	Fusion Technol., 10: No. 3, 1309-1314(Nov 1986)			12:17534
	Fusion Technol., 10: No. 3, 498-503(Nov 1986)			12:17535
	Fusion Technol., 10: No. 3, 504-507(Nov 1986)			12:17536
	Fusion Technol., 10: No. 3, 1034-1040(Nov 1986)			12:17537
	Fusion Technol., 10: No. 3, 521-526(Nov 1986)			12:17538
	Fusion Technol., 10: No. 3, 902-907(Nov 1986)			12:17539
	Fusion Technol., 10: No. 3, 978-984(Nov 1986)			12:17540
	Fusion Technol., 10: No. 3, 1024-1029(Nov 1986)			12:17541
	Fusion Technol., 10: No. 3, 1030-1033(Nov 1986)			12:17542
	Fusion Technol., 10: No. 3, 1111-1116(Nov 1986)			12:17543
	Fusion Technol., 10: No. 3, 1329-1333(Nov 1986)			12:17544
	Fusion Technol., 10: No. 3, 1334-1339(Nov 1986)			12:17545
	Fusion Technol., 10: No. 3, 1191-1196(Nov 1986)			12:17546
	Fusion Technol., 10: No. 3, 1197-1204(Nov 1986)			12:17547
	Fusion Technol., 10: No. 3, 1205-1210(Nov 1986)			12:17548
	Fusion Technol., 10: No. 3, 1211-1215(Nov 1986)			12:17549
	Fusion Technol., 10: No. 3, 1216-1222(Nov 1986)			12:17550
	Fusion Technol., 10: No. 3, 1223-1227(Nov 1986)			12:17551
	Fusion Technol., 10: No. 3, 1228-1233(Nov 1986)			12:17552
	Fusion Technol., 10: No. 3, 1234-1242(Nov 1986)			12:17553
	Fusion Technol., 10: No. 3, 881-889(Nov 1986)			12:17554
	Fusion Technol., 10: No. 3, 908-913(Nov 1986)			12:17555
	Fusion Technol., 10: No. 3, 649-655(Nov 1986)			12:17556
	Fusion Technol., 10: No. 3, 664-673(Nov 1986)			12:17557
	Fusion Technol., 10: No. 3, 674-676(Nov 1986)			12:17558
	Fusion Technol., 10: No. 3, 677-678(Nov 1986)			12:17559
	Fusion Technol., 10: No. 3, 679-685(Nov 1986)			12:17560
	Fusion Technol., 10: No. 3, 686-694(Nov 1986)			12:17561
	Fusion Technol., 10: No. 3, 695-703(Nov 1986)			12:17562

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
	Fusion Technol., 10: No. 3, 1243-1244(Nov 1986)			12:17563
	Fusion Technol., 10: No. 3, 1245-1250(Nov 1986)			12:17564
	Fusion Technol., 10: No. 3, 1251-1252(Nov 1986)			12:17565
	Fusion Technol., 10: No. 3, 1253-1258(Nov 1986)			12:17566
	Fusion Technol., 10: No. 3, 1259-1263(Nov 1986)			12:17567
	Fusion Technol., 10: No. 3, 1264-1269(Nov 1986)			12:17568
	Fusion Technol., 10: No. 3, 1270-1278(Nov 1986)			12:17569
	Fusion Technol., 10: No. 3, 527-532(Nov 1986)			12:17570
	Fusion Technol., 10: No. 3, 591-598(Nov 1986)			12:17571
	Fusion Technol., 10: No. 3, 719-727(Nov 1986)			12:17572
	Fusion Technol., 10: No. 3, 728-733(Nov 1986)			12:17573
	Fusion Technol., 10: No. 3, 734-740(Nov 1986)			12:17574
	Fusion Technol., 10: No. 3, 741-746(Nov 1986)			12:17575
	Fusion Technol., 10: No. 3, 747-752(Nov 1986)			12:17576
	Fusion Technol., 10: No. 3, 761-769(Nov 1986)			12:17577
	Fusion Technol., 10: No. 3, 776-781(Nov 1986)			12:17578
	Fusion Technol., 10: No. 3, 782-788(Nov 1986)			12:17579
	Fusion Technol., 10: No. 3, 985-989(Nov 1986)			12:17580
	Fusion Technol., 10: No. 3, 990-994(Nov 1986)			12:17581
	Fusion Technol., 10: No. 3, 1000-1005(Nov 1986)			12:17582
	Fusion Technol., 10: No. 3, 1006-1014(Nov 1986)			12:17583
	Fusion Technol., 10: No. 3, 1047-1052(Nov 1986)			12:17584
	Fusion Technol., 10: No. 3, 1652(Nov 1986)			12:17585
	Fusion Technol., 10: No. 3, 1404-1411(Nov 1986)			12:17586
	Fusion Technol., 10: No. 3, 1412-1417(Nov 1986)			12:17587
	Fusion Technol., 10: No. 3, 1438-1442(Nov 1986)			12:17588
	Fusion Technol., 10: No. 3, 1466-1476(Nov 1986)			12:17589
	Fusion Technol., 10: No. 3, 1557-1564(Nov 1986)			12:17590
	Fusion Technol., 10: No. 3, 1565-1570(Nov 1986)			12:17591
	Fusion Technol., 10: No. 3, 1571-1576(Nov 1986)			12:17592
	Fusion Technol., 10: No. 3, 1590-1595(Nov 1986)			12:17593
	Fusion Technol., 10: No. 3, 1443-1448(Nov 1986)			12:17594
	Fusion Technol., 10: No. 3, 1449-1455(Nov 1986)			12:17595
	Fusion Technol., 10: No. 3, 1456-1460(Nov 1986)			12:17596
	Fusion Technol., 10: No. 3, 1483-1488(Nov 1986)			12:17597
	Fusion Technol., 10: No. 3, 1495-1502(Nov 1986)			12:17598
	Fusion Technol., 10: No. 3, 1577-1582(Nov 1986)			12:17599
	Fusion Technol., 10: No. 3, 1611-1616(Nov 1986)			12:17600
	Fusion Technol., 10: No. 3, 1617-1622(Nov 1986)			12:17601
	Fusion Technol., 10: No. 3, 1623-1627(Nov 1986)			12:17602
	Fusion Technol., 10: No. 3, 1628-1633(Nov 1986)			12:17603
	Fusion Technol., 10: No. 3, 1634-1639(Nov 1986)			12:17604
	Fusion Technol., 10: No. 3, 1640-1645(Nov 1986)			12:17605
	Fusion Technol., 10: No. 3, 1503-1512(Nov 1986)			12:17606
	Fusion Technol., 10: No. 3, 1524-1529(Nov 1986)			12:17607
	Fusion Technol., 10: No. 3, 1536-1541(Nov 1986)			12:17608
	Fusion Technol., 10: No. 3, 1542-1547(Nov 1986)			12:17609
	Fusion Technol., 10: No. 3, 1548-1556(Nov 1986)			12:17610
	Fusion Technol., 10: No. 3, 1355-1361(Nov 1986)			12:17611
	Fusion Technol., 10: No. 3, 1362-1366(Nov 1986)			12:17612
	Fusion Technol., 10: No. 3, 1367-1374(Nov 1986)			12:17613
	Fusion Technol., 10: No. 3, 1596-1604(Nov 1986)			12:17614
	Fusion Technol., 10: No. 3, 1423(Nov 1986)			12:17615
	Fusion Technol., 10: No. 3, 1424-1426(Nov 1986)			12:17616
	Fusion Technol., 10: No. 3, 1427-1428(Nov 1986)			12:17617
	Fusion Technol., 10: No. 3, 1431-1432(Nov 1986)			12:17618
	Fusion Technol., 10: No. 3, 1433-1434(Nov 1986)			12:17619
	Fusion Technol., 10: No. 3, 1435-1436(Nov 1986)			12:17620
	Fusion Technol., 10: No. 3, 1437(Nov 1986)			12:17621
	Fusion Technol., 10: No. 3, 1461-1465(Nov 1986)			12:17622
	Fusion Technol., 10: No. 3, 1477-1482(Nov 1986)			12:17623
CONF-8606101-	(5. international conference on ion beam modification of materials, Catania, Italy, 9-11 Jun 1986)			
7	*See* CEA-CONF-8531	DE87750460	MN -28	12:16536
8	*See* CEA-CONF-8540	DE87750467	MN -25	12:16349
CONF-8606151-	(76. annual meeting of the Federation of American Society for Experimental Biology, Washington, DC, USA, 8-12 Jun 1986)			
	Fed. Proc., Fed. Am. Soc. Exp. Biol., 45: No. 6, 1831(May 1986)			12:16797
CONF-8606171-	(IAEA meeting on the coordination of the international nuclear structure and decay data evaluation network, Grenoble, France, 2-5 Jun 1986)			
Summ.	*See* INDC(NDS)-182/GE	DE87700915	MN -34C	12:17196
CONF-8606197-	(Joint conference on the introduction and development of methanol as an alternative fuel, Columbus, OH, USA, 26-27 Jun 1986)			
1	*See* BNL-39087	E 1.99: DE87005391	MN -92	12:15587
CONF-8606215-	(Summer study on the physics of the superconducting super collider)			
10	*See* ANL-HEP-CP-86-107	E 1.99: DE87001561	MN -34	12:17094
28	*See* SLAC-PUB-4144	DE87004559	MN -34D	12:17155
30	*See* ANL-HEP-CP-86-122	E 1.99: DE87004972	MN -28	12:16503
31	*See* ANL-HEP-CP-86-134	E 1.99: DE87004967	MN -34D	12:17124

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
33 CONF-8606229-	*See* ANL-HEP-CP-86-126 (3. workshop on radiations chemistry, Autrans, France, 10-13 Jun 1986)		DE87004734	MN -37	12:16594
2-Summ. CONF-8606230-	*See* CEA-CONF-8520 (8. international conference on spectral line shapes, Williamsburg, VA, USA, 9-13 Jun 1986)		DE87750455	MN -4	12:16427
1-Summ. CONF-8606241-	*See* CEA-CONF-8530 (3. Continuous Electron Beam Accelerator Facility summer school, Newport News, VA, USA, 23-27 Jun 1986)		DE87750456	MN -34A	12:17062
5 CONF-8606258-	NTIS, PC A02/MF A01 (GPO Dep.) (Biological treatment of coal workshop, Washington, DC, USA, 23-25 Jun 1986)	E 1.99:	DE87001557	MN -34D	12:16601
1 CONF-8606259-	*See* BNL-38267 (Theoretical Advanced Study Institute conference, Santa Cruz, CA, USA, 1 Jun 1986, 1 Jun 1986)	E 1.99:	DE87005246	MN -90a	12:15269
1 CONF-860701-	*See* LA-UR-86-4152 (23. international conference on high-energy physics, Berkeley, CA, USA, 16-23 Jul 1986)	E 1.99:	DE87003727	MN -34D	12:17179
70 CONF-860709-	*See* BNL-39062 (Conference on research and applications of aquatic plants for water treatment and resource recovery, Orlando, FL, USA, 20-24 Jul 1986)	E 1.99:	DE87004612	MN -34D	12:17126
3 CONF-860711-	Institute of Gas Technology, 3424 South State Street, Chicago, IL 60616 (Small scale turbulence and anomalous transport in magnetized plasmas, Cargese, France, 7-13 Jul 1986)		TI87900436	MN -61C	12:15585
2 CONF-860717-	*See* LRP-306/86 (2. tar sand symposium, Jackson, WY, USA, 8-10 Jul 1986)		DE87900430	MN -20	12:17412
See DOE/METC-87/6073 CONF-860741-	(International symposium on weak and electromagnetic interactions in nuclei, Heidelberg, F.R. Germany, 1-5 Jul 1986)	E 1.99:	DE87001002	MN -91	12:15371
19 CONF-860751-	*See* CEA-CONF-8542 (3. international workshop on statistical and scientific database management, Luxembourg, Luxembourg, 22-24 Jul 1986)		DE87750463	MN -34C	12:17204
3 CONF-860756-	*See* PNL-SA-14017 (NATO advanced course on high brightness accelerators, Pitlochry, Scotland, 13-25 Jul 1986)	E 1.99:	DE87004129	MN -32	12:17656
7 CONF-860763-	*See* LA-UR-86-2243 (Nondestructive characterization of materials, Montreal, Canada, 21-23 Jul 1986)	E 1.99:	DE87005133	MN -28	12:16513
5 CONF-860789-	NTIS MF A01; 2 (GPO Dep.) (International workshop on condensed matter theories, Argonne, IL, USA, 21-26 Jul 1986)	E 1.99:	DE87004987	MN -90h	12:16327
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004991	MN -25	12:17357
4 CONF-8607107-	NTIS, PC A02/MF A01; 1 (GPO Dep.) (19. national symposium on fracture mechanics, San Antonio, TX, USA, 1 Jul 1986, 1 Jul 1986)	E 1.99:	DE87004989	MN -25	12:16247
1 CONF-8607108-	*See* HEDL-SA-3319-FP (IUA symposium no. 123, Aarhus, Denmark, 7-11 Jul 1986)	E 1.99:	DE87004085	MN -79	12:16278
1 CONF-8607110-	*See* LA-UR-86-3395 (Workshop on petroleum and natural gas in the Kernforschungsanlage Juelich, Juelich, F.R. Germany, 1-2 Jul 1986)	E 1.99:	DE87001954	MN -34B	12:16963
See Juel-Conf-58 CONF-8607112-	(Interstellar processes conference, Jackson, WY, USA, 1 Jul 1986, 1 Jul 1986)		DE87751309	MN -92	12:16159
1 CONF-860802-	NTIS, PC A02/MF A01 (GPO Dep.) (International nuclear physics conference, Harrogate, UK, 25-30 Aug 1986)	E 1.99:	DE87003375	MN -34B	12:16941
3-Summ.	*See* CEA-CONF-8547		DE87750468	MN -34C	12:17233
4-Summ.	*See* CEA-CONF-8546		DE87750469	MN -34C	12:17205
6 CONF-860808-	*See* GSI-86-32-Prepr. (7. international congress on photosynthesis, Providence, RI, USA, 10-15 Aug 1986)		DE87750500	MN -34C	12:17261
11 CONF-860845-	*See* BNL-38870 (8. international conference on vacuum ultraviolet radiation physics, Lund, Sweden, 4-8 Aug 1986)	E 1.99:	DE87003203	MN -48	12:15598
4 CONF-8608108-	NTIS, PC A03/MF A01; 1 (GPO Dep.) (International seminar on dynamic processes of highly charged ions, Susono, Shizuoka-ken, Japan, 21-24 Aug 1986)	E 1.99:	DE87004732	MN -34A	12:17066
5 CONF-8608123-	NTIS MF A01; 2 (GPO Dep.) (Advanced accelerator concepts conference, Madison, WI, USA, 21-27 Aug 1986)	E 1.99:	DE87004988	MN -34A	12:17067
10 CONF-8608130-	*See* ANL-HEP-CP-86-105 (Stellar pulsation conference, Los Alamos, NM, USA, 11-15 Aug 1986)	E 1.99:	DE87004945	MN -28	12:16502
9	*See* LA-UR-86-4115	E 1.99:	DE87003721	MN -34B	12:16964
10	*See* LA-UR-86-4116	E 1.99:	DE87003722	MN -34B	12:16965

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-8608135-	(INS international symposium on hypernuclear physics, Tokyo, Japan, 20-23 Aug 1986)				
2	*See* TRI-PP-86-100		DE87900322	MN -34C	12:17299
CONF-8608141-	(Industrial symposium on ecological aspects of tree ring analysis, Terrytown, NY, USA, 17-21 Aug 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87002412	MN -11	12:16773
CONF-8608145-	(6. international conference on methods in protein sequence analysis, Seattle, WA, USA, 1 Aug 1986, 1 Aug 1986)				
1	*See* BNL-38848		DE87003197	MN -48	12:16794
CONF-8608147-	(International conference on high-speed electronics, Stockholm, Sweden, 7-9 Aug 1986)				
	See LA-UR-86-4286		DE87003745	MN -38	12:16492
2	*See* LA-UR-86-4285		DE87003744	MN -38	12:16491
CONF-8608150-	(Advances in peatlands engineering, Ottawa, Canada, 25-26 Aug 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003952	MN -90	12:15274
CONF-8608153-	(International Metallographic Society conference on microstructural science, Boston, MA, USA, 3-7 Aug 1986)				
1	*See* UCRL-94386	E 1.99:	DE87004113	MN -25	12:16299
2	*See* EGG-M-18286	E 1.99:	DE87000439	MN -25	12:16269
CONF-860904-	(International gas research conference, Toronto, Canada, 8-11 Sep 1986)				
3	*See* BNL-39089	E 1.99:	DE87005389	MN -92	12:15589
CONF-860905-	(International meeting on low, intermediate and high level waste management - decontamination and decommissioning, Niagara Falls, NY, USA, 14-18 Sep 1986)				
28	*See* BNL-NUREG-39007		TI87004171	MN -70B	12:15408
CONF-860906-	(Advances in reactor physics and safety meeting, Saratoga Springs, NY, USA, 17-19 Sep 1986)				
19	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004979	MN -79	12:16015
21	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87004995	MN -79	12:15846
22	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004994	MN -79	12:15973
23	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004712	MN -79	12:15974
CONF-860908-	(Operability of nuclear power systems in normal and adverse environments meeting, Albuquerque, NM, USA, 29 Sep-3 Oct 1986)				
38	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004714	MN -79	12:15847
39	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004981	MN -79	12:15975
40	NTIS, PC A02; 3		DE87004974	MN -79	12:15976
CONF-860910-	(2. international conference on radioactive waste management, Winnipeg, Manitoba, Canada, 7-12 Sep 1986)				
3	*See* PNL-SA-13772		DE87004918	MN -70	12:15446
CONF-860911-	(192. American Chemical Society national meeting, Anaheim, CA, USA, 7-12 Sep 1986)				
26	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004950	MN -90a	12:15300
27	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004667	MN -78	12:15965
CONF-860914-	(Applied superconductivity conference (ASC '86), Baltimore, MD, USA, 28 Sep-4 Oct 1986)				
27	*See* LBL-21293	E 1.99:	DE87003524	MN -28	12:16565
31	NTIS, PC A02; 3		DE87004676	MN -25	12:17354
CONF-860917-	(14. SOFT - symposium on fusion technology, Avignon, France, 8-12 Sep 1986)				
8	*See* CEA-CONF-8557		DE87750461	MN -21	12:17430
CONF-860921-	(ISEC '86: international solvent extraction conference, Munich, F.R. Germany, 11-16 Sep 1986)				
7	*See* DOE/ER/13357-5	E 1.99:	DE87003910	MN -34A	12:16384
CONF-860931-	(International conference on reliable fuels for liquid metal reactors, Tucson, AZ, USA, 7-11 Sep 1986)				
4	*See* CEA-CONF-8553		DE87750557	MN -79b	12:16244
5	*See* HEDL-SA-3475-FP	E 1.99:	DE87004346	MN -79b	12:15834
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004487	MN -79	12:15977
8	*See* HEDL-SA-3484-FP	E 1.99:	DE87004348	MN -79b	12:15855
9	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87004980	MN -79	12:15848
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004978	MN -79	12:16016
12	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87004998	MN -79	12:15978
13	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004997	MN -79	12:15979
15	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004759	MN -79	12:15849
16	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004756	MN -79b	12:15850
CONF-860939-	(13. world conference of the Nuclear Target Development Society, Chalk River, Canada, 17-19 Sep 1986)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004715	MN -28	12:16538
CONF-860943-	(6. physics in collision, Chicago, IL, USA, 3-5 Sep 1986)				
2	*See* ANL-HEP-CP-86-133	E 1.99:	DE87004842	MN -34D	12:17095
CONF-860948-	(3. annual Pittsburgh coal conference, Pittsburgh, PA, USA, 8-12 Sep 1986)				
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003955	MN -90c	12:15271

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-860953-	(International conference on vacancies and interstitials in metals and alloys, Berlin, F.R. Germany, 14-19 Sep 1986)			
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004653	MN -25	12:16248
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004677	MN -25	12:16249
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004652	MN -25	12:16250
8	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004845	MN -25	12:16251
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004664	MN -25	12:16252
CONF-860961-	(Instrumentation, components and materials contractors' meeting, Morgantown, WV, USA, 16-17 Sep 1986)			
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004661	MN -90h	12:15323
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004659	MN -90h	12:15272
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004654	MN -90c	12:15273
8	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004662	MN -90h	12:16599
CONF-860968-	(3. international conference on the science of technology of zirconia, Tokyo, Japan, 9-11 Sep 1986)			
4	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004720	MN -25	12:16328
CONF-8609135-	(International symposium on muon-catalyzed fusion, Tokyo, Japan, 1-3 Sep 1986)			
7	*See* LBL-22560	E 1.99: DE87004475	MN -34C	12:17207
CONF-8609142-	(Lattice gauge theory meeting. Upton, NY, USA, 15-19 Sep 1986)			
2	*See* LA-UR-86-4144	E 1.99: DE87003726	MN -34D	12:17160
CONF-8609147-	(American Nuclear Society annual meeting, Bethesda, MD, USA, 15-17 Sep 1986)			
8	*See* EGG-10282-1122	E 1.99: DE87002863	MN -41	12:16914
CONF-8609151-	(7. international symposium on high energy spin physics, Protvino, USSR, 22-27 Sep 1986)			
4	*See* ANL-HEP-CP-86-130	E 1.99: DE87004841	MN -34D	12:17123
5	*See* BNL-39168	E 1.99: DE87005257	MN -34D	12:17096
CONF-8609154-	(Joint PETC/METC direct utilization AR and TD contractors review meeting, Warrendale, PA, USA, 22-25 Sep 1986)			
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004674	MN -90	12:15679
CONF-8609159-	(International school-seminar on heavy ion physics, Dubna, USSR, 23-30 Sep 1986)			
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004983	MN -34C	12:17242
CONF-8609163-	(International conference and symposia on unified concepts of many-body problems, Stony Brook, NY, USA, 4-6 Sep 1986)			
8	*See* LA-UR-86-4264	E 1.99: DE87003743	MN -34	12:17298
CONF-8609173-	(2. conference on hypercube multiprocessors, Knoxville, TN, USA, 29-30 Sep 1986)			
6	*See* DOE/ER/25009-378	E 1.99: DE87005030	MN -32	12:17646
CONF-8609181-	(ACS symposium on syngas conversion catalysis advances in gasification, Santa Clara, CA, USA, 7-12 Sep 1986)			
	Prepr. Pap., Am. Chem. Soc., Div. Fuel Chem., 31: No. 3, 158-165(1986)			12:15297
	Prepr. Pap., Am. Chem. Soc., Div. Fuel Chem., 31: No. 3, 186-193(1986)			12:15298
	Prepr. Pap., Am. Chem. Soc., Div. Fuel Chem., 31: No. 3, 294-299(1986)			12:15374
	Prepr. Pap., Am. Chem. Soc., Div. Fuel Chem., 31: No. 3, 166-175(1986)			12:15583
CONF-8609187-	(6. congress on dynamics of molecular collisions and half-collisions (MOLEC-6), Aussois, France, 8-12 Sep 1986)			
1-Summ.	*See* CEA-CONF-8555	DE87750576	MN -34A	12:17063
2-Summ.	*See* CEA-CONF-8556	DE87750577	MN -34A	12:17064
CONF-8609189-	(8. international congress on cement chemistry, Rio de Janeiro, Brazil, 22-27 Sep 1986)			
1	*See* CEA-CONF-8558	DE87750587	MN -25	12:16350
CONF-8609203-	(International symposium on in-vivo body composition studies, Upton, NY, USA, 28 Sep-1 Oct 1986)			
4	*See* BNL-39169	E 1.99: DE87005254	MN -48	12:16885
CONF-8609226-	(7. Air Infiltration Centre conference, occupant interaction with ventilation systems, Stratford-upon-Avon, UK, 29 Sep-2 Oct 1986)			
1	*See* LBL-21862	E 1.99: DE87003550	MN -11	12:16203
CONF-8609227-	(IAEA specialists meeting on fast reactor cover gas purification, Richland, WA, USA, 24-26 Sep 1986)			
2	*See* HEDL-SA-3589-FP	E 1.99: DE87004432	MN -79a	12:15984
CONF-8609228-	(National forum on biodiversity, Washington, DC, USA, 21-25 Sep 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004660	MN -61	12:15600
CONF-8609230-	(Electrochemical sciences conference, Cleveland, OH, USA, 14-17 Sep 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004870	MN -93A	12:16192
CONF-8609234-	(International collaboration on advanced neutron sources)			
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004846	MN -28	12:16542
2	*See* LA-UR-86-4387	E 1.99: DE87003763	MN -37	12:16648

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-8609236-	(Georgia public utilities conference, Atlanta, GA, USA, 10-12 Sep 1986)				
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005217	MN -98E	12:16171
CONF-8609239-	(Electrophoresis '86: 5th meeting of the International Electrophoresis Society, London, UK, 9-12 Sep 1986)				
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004943	MN -48	12:16795
CONF-8609243-	(Governor's conference on science and technology in Illinois, Rosemont, IL, USA, 3-4 Sep 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004682	MN -48	12:15601
CONF-861007-	(Nuclear science and nuclear power systems symposium, Washington, DC, USA, 29-31 Oct 1986)				
23	NTIS, PC A02; 3		DE87004956	MN -37	12:16600
CONF-861008-	(Fuel cell seminar, Tucson, AZ, USA, 26-30 Oct 1986)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004823	MN -97d	12:16188
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004862	MN -93A	12:16189
4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004863	MN -93A	12:16190
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004929	MN -93A	12:16191
CONF-861027-	(5. international conference on reliability and maintainability, Biarritz, France, 6-10 Oct 1986)				
2	*See* CEA-CONF-8562		DE87750473	MN -25	12:16245
CONF-861032-	(High level waste business: transportation, storage and disposal, Charleston, SC, USA, 19-22 Oct 1986)				
2	*See* SAND-86-2474C	E 1.99:	DE87001733	MN -71	12:16446
CONF-861038-	(OSA/APS international laser science conference)				
5	*See* LA-UR-87-22	E 1.99:	DE87005124	MN -34	12:17386
6	*See* LA-UR-86-4187	E 1.99:	DE87003734	MN -34	12:17351
CONF-861063-	(American Society of Metals materials week, Lake Buena Vista, FL, USA, 6-9 Oct 1986)				
2	*See* PNL-SA-14033		DE87004919	MN -25	12:16294
3	*See* N-87-11875				12:16288
CONF-861068-	(Electrochemical Society fall meeting, San Diego, CA, USA, 19-24 Oct 1986)				
15	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87004865	MN -94c	12:16148
16	NTIS, PC A02; 3		DE87005028	MN -25	12:16253
CONF-861076-	(Fall meeting of the Metallurgical Society of AIME, Orlando, FL, USA, 5-9 Oct 1986)				
4	*See* LA-UR-86-4347	E 1.99:	DE87003757	MN -25	12:16283
CONF-861096-	(International symposium on methodologies for intelligent systems, Knoxville, TN, USA, 22-24 Oct 1986)				
3	NTIS, PC A02; 3		DE87004617	MN -32	12:17641
CONF-8610115-	(4. international symposium on the production and neutralization of negative ions and beams, Upton, NY, USA, 27-31 Oct 1986)				
10	*See* UCRL-95853		DE87004360	MN -34A	12:17083
15	*See* LBL-22445	E 1.99:	DE87004476	MN -28	12:16566
18	*See* LA-UR-86-3863	E 1.99:	DE87005130	MN -28	12:16564
19	*See* LA-UR-86-3861	E 1.99:	DE87005131	MN -28	12:16563
CONF-8610122-	(8. international electric vehicle symposium)				
12	NTIS, PC A02; 3		DE87004928	MN -96	12:16234
13	NTIS, PC A02; 3		DE87004930	MN -96	12:16149
CONF-8610135-	(14. water reactor safety information meeting, Gaithersburg, MD, USA, 27-31 Oct 1986)				
43	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004077	MN -78	12:15763
46	*See* EGG-M-25986	E 1.99:	DE87004535	MN -78	12:16024
47	*See* EGG-M-27686	E 1.99:	DE87004534	MN -78	12:16025
49	*See* BNL-NUREG-39048	E 1.99:	TI87004603	MN -78	12:16004
51	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004958	MN -78	12:16018
53	*See* SAND-86-2909C	E 1.99:	DE87005066	MN -78	12:16062
54	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004937	MN -78	12:16019
55	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004934	MN -78	12:15764
56	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004985	MN -78	12:16020
57	*See* BNL-NUREG-39156		TI87005242	MN -78	12:16005
58	*See* BNL-NUREG-39157		TI87005245	MN -78	12:16006
59	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004939	MN -78	12:15765
CONF-8610136-	(SIPRI/CLIPS study on a comprehensive test ban, Ottawa, Canada, 23-25 Oct 1986)				
2-Rev.1	*See* UCRL-95155-Rev.1	E 1.99:	DE87004353	MN -13	12:16685
3-Rev.2	*See* UCRL-95026-Rev.2	E 1.99:	DE87002552	MN -35	12:16683
CONF-8610153-	(Autumn metallurgy meeting, Paris, France, 14-16 Oct 1986)				
1	*See* CEA-CONF-8563		DE87750474	MN -25	12:16246
CONF-8610156-	(Plutonium/uranium chemical recovery operations conference, Aiken, SC, USA, 14-16 Oct 1986)				
2	NTIS, PC A02/MF A01; 1		DE87004859	MN -86	12:15384
CONF-8610159-	(International symposium on the physics and chemistry of small clusters, Richmond, VA, USA, 28 Oct-1 Nov 1986)				
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004935	MN -25	12:16401
CONF-8610162-	(7. international workshop on laser interaction and related plasma phenomena, Monterey, CA, USA, 28 Oct-1 Nov 1986)				
1	*See* CEA-CONF-8564		DE87750571	MN -20d	12:17431

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-8610164-	(International Atomic Energy Agency conference, Bologna, Italy, 6-10 Oct 1986)				
2	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87004962	MN -34C	12:17257
CONF-8610196-	(European workshop on few body physics, Rome, Italy, 7-11 Oct 1986)				
4	*See* TRI-PP-86-86		DE87900303	MN -28	12:16569
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004933	MN -34C	12:17206
CONF-8610203-	(CIM SUBWOG 39E meeting, Aldermaston, UK, 6-9 Oct 1986)				
1	*See* SAND-86-1907C		DE87002494	MN -38	12:16445
CONF-8610207-	(20. ESLAB symposium, Heidelberg, F.R. Germany, 27-31 Oct 1986)				
3	*See* LA-UR-86-4331		DE87003752	MN -34B	12:16966
8	*See* LA-UR-87-38	E 1.99:	DE87005123	MN -34B	12:16967
CONF-8610209-	(RCNP/Kikuchi summer school on accelerator technology, Osaka, Japan, 20-23 Oct 1986)				
1	*See* LBL-22450	E 1.99:	DE87003532	MN -28	12:16567
CONF-8610212-	(Strategic defense: commercial applications and political-economic implications conference, Kiel, F.R. Germany, 17-19 Oct 1986)				
1	*See* UCRL-95532	E 1.99:	DE87003884	MN -13	12:17632
CONF-8610218-	(7. Digital Avionics Systems Conference (DASC), Fort Worth, TX, USA, 13-16 Oct 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004817	MN -32	12:17644
CONF-8610220-	(DOE contractors meeting, Pittsburgh, PA, USA, 21-22 Oct 1986)				
2	*See* PNL-SA-14167	E 1.99:	DE87002870	MN -90d	12:15295
CONF-8610226-	(6. annual plutonium pyrochemical workshop, Los Alamos, NM, USA, 7-8 Oct 1986)				
1	*See* DP-MS-86-167	E 1.99:	DE87004187	MN -10	12:15387
CONF-8610239-	(Symposium celebrating 35 years of electron scattering in nuclear and particle science, Urbana, IL, USA, 23-24 Oct 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004959	MN -34C	12:17203
CONF-861102-	(American Nuclear Society and Atomic Industrial Forum joint meeting, Washington, DC, USA, 16-21 Nov 1986)				
	Trans. Am. Nucl. Soc., 53: 118-119(1986)				12:15390
	Trans. Am. Nucl. Soc., 53: 484-485(1986)				12:15391
	Trans. Am. Nucl. Soc., 53: 157-158(1986)				12:15392
	Trans. Am. Nucl. Soc., 53: 159-160(1986)				12:15393
	Trans. Am. Nucl. Soc., 53: 515-516(1986)				12:15394
	Trans. Am. Nucl. Soc., 53: 516-517(1986)				12:15395
	Trans. Am. Nucl. Soc., 53: 517-518(1986)				12:15396
	Trans. Am. Nucl. Soc., 53: 120(1986)				12:15401
	Trans. Am. Nucl. Soc., 53: 120-121(1986)				12:15402
	Trans. Am. Nucl. Soc., 53: 122-124(1986)				12:15403
	Trans. Am. Nucl. Soc., 53: 156-157(1986)				12:15404
	Trans. Am. Nucl. Soc., 53: 94-95(1986)				12:15453
	Trans. Am. Nucl. Soc., 53: 95(1986)				12:15454
	Trans. Am. Nucl. Soc., 53: 95-96(1986)				12:15455
	Trans. Am. Nucl. Soc., 53: 96-97(1986)				12:15456
	Trans. Am. Nucl. Soc., 53: 97-98(1986)				12:15457
	Trans. Am. Nucl. Soc., 53: 98-100(1986)				12:15458
	Trans. Am. Nucl. Soc., 53: 100-102(1986)				12:15459
	Trans. Am. Nucl. Soc., 53: 110-112(1986)				12:15460
	Trans. Am. Nucl. Soc., 53: 112-113(1986)				12:15461
	Trans. Am. Nucl. Soc., 53: 113-115(1986)				12:15462
	Trans. Am. Nucl. Soc., 53: 115(1986)				12:15463
	Trans. Am. Nucl. Soc., 53: 115-116(1986)				12:15464
	Trans. Am. Nucl. Soc., 53: 116(1986)				12:15465
	Trans. Am. Nucl. Soc., 53: 121-122(1986)				12:15466
	Trans. Am. Nucl. Soc., 53: 125-126(1986)				12:15467
	Trans. Am. Nucl. Soc., 53: 126-127(1986)				12:15468
	Trans. Am. Nucl. Soc., 53: 127-129(1986)				12:15469
	Trans. Am. Nucl. Soc., 53: 130(1986)				12:15470
	Trans. Am. Nucl. Soc., 53: 131(1986)				12:15471
	Trans. Am. Nucl. Soc., 53: 131-132(1986)				12:15472
	Trans. Am. Nucl. Soc., 53: 133-135(1986)				12:15473
	Trans. Am. Nucl. Soc., 53: 134-135(1986)				12:15474
	Trans. Am. Nucl. Soc., 53: 135-136(1986)				12:15475
	Trans. Am. Nucl. Soc., 53: 136-137(1986)				12:15476
	Trans. Am. Nucl. Soc., 53: 478-479(1986)				12:15477
	Trans. Am. Nucl. Soc., 53: 479-481(1986)				12:15478
	Trans. Am. Nucl. Soc., 53: 482(1986)				12:15479
	Trans. Am. Nucl. Soc., 53: 482-484(1986)				12:15480
	Trans. Am. Nucl. Soc., 53: 484(1986)				12:15481
	Trans. Am. Nucl. Soc., 53: 489-490(1986)				12:15482
	Trans. Am. Nucl. Soc., 53: 490-491(1986)				12:15483
	Trans. Am. Nucl. Soc., 53: 498-499(1986)				12:15484
	Trans. Am. Nucl. Soc., 53: 155-156(1986)				12:15485
	Trans. Am. Nucl. Soc., 53: 74-76(1986)				12:15566
	Trans. Am. Nucl. Soc., 53: 76-80(1986)				12:15567
	Trans. Am. Nucl. Soc., 53: 158-159(1986)				12:15577

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
	Trans. Am. Nucl. Soc., 53: 163-164(1986)			12:15578
	Trans. Am. Nucl. Soc., 53: 164-165(1986)			12:15579
	Trans. Am. Nucl. Soc., 53: 161-162(1986)			12:15581
	Trans. Am. Nucl. Soc., 53: 76(1986)			12:15778
	Trans. Am. Nucl. Soc., 53: 87-88(1986)			12:15779
	Trans. Am. Nucl. Soc., 53: 89-90(1986)			12:15780
	Trans. Am. Nucl. Soc., 53: 104-105(1986)			12:15781
	Trans. Am. Nucl. Soc., 53: 108-109(1986)			12:15782
	Trans. Am. Nucl. Soc., 53: 219-220(1986)			12:15783
	Trans. Am. Nucl. Soc., 53: 263-265(1986)			12:15784
	Trans. Am. Nucl. Soc., 53: 380-381(1986)			12:15785
	Trans. Am. Nucl. Soc., 53: 401(1986)			12:15786
	Trans. Am. Nucl. Soc., 53: 431-432(1986)			12:15787
	Trans. Am. Nucl. Soc., 53: 440-441(1986)			12:15788
	Trans. Am. Nucl. Soc., 53: 258-260(1986)			12:15789
	Trans. Am. Nucl. Soc., 53: 51-52(1986)			12:15790
	Trans. Am. Nucl. Soc., 53: 56-57(1986)			12:15791
	Trans. Am. Nucl. Soc., 53: 57(1986)			12:15792
	Trans. Am. Nucl. Soc., 53: 535-537(1986)			12:15793
	Trans. Am. Nucl. Soc., 53: 546-547(1986)			12:15794
	Trans. Am. Nucl. Soc., 53: 549-551(1986)			12:15795
	Trans. Am. Nucl. Soc., 53: 84-85(1986)			12:15806
	Trans. Am. Nucl. Soc., 53: 103(1986)			12:15807
	Trans. Am. Nucl. Soc., 53: 105-108(1986)			12:15808
	Trans. Am. Nucl. Soc., 53: 207-208(1986)			12:15809
	Trans. Am. Nucl. Soc., 53: 208-209(1986)			12:15810
	Trans. Am. Nucl. Soc., 53: 209-210(1986)			12:15811
	Trans. Am. Nucl. Soc., 53: 210-211(1986)			12:15812
	Trans. Am. Nucl. Soc., 53: 211(1986)			12:15813
	Trans. Am. Nucl. Soc., 53: 218-219(1986)			12:15814
	Trans. Am. Nucl. Soc., 53: 246-247(1986)			12:15815
	Trans. Am. Nucl. Soc., 53: 247-249(1986)			12:15816
	Trans. Am. Nucl. Soc., 53: 376-377(1986)			12:15817
	Trans. Am. Nucl. Soc., 53: 377-378(1986)			12:15818
	Trans. Am. Nucl. Soc., 53: 378-380(1986)			12:15819
	Trans. Am. Nucl. Soc., 53: 384(1986)			12:15820
	Trans. Am. Nucl. Soc., 53: 395-396(1986)			12:15821
	Trans. Am. Nucl. Soc., 53: 396-397(1986)			12:15822
	Trans. Am. Nucl. Soc., 53: 397-398(1986)			12:15823
	Trans. Am. Nucl. Soc., 53: 402(1986)			12:15824
	Trans. Am. Nucl. Soc., 53: 403-404(1986)			12:15825
	Trans. Am. Nucl. Soc., 53: 405-408(1986)			12:15826
	Trans. Am. Nucl. Soc., 53: 429-430(1986)			12:15827
	Trans. Am. Nucl. Soc., 53: 435-437(1986)			12:15828
	Trans. Am. Nucl. Soc., 53: 443(1986)			12:15829
	Trans. Am. Nucl. Soc., 53: 46-48(1986)			12:15830
	Trans. Am. Nucl. Soc., 53: 49-50(1986)			12:15831
	Trans. Am. Nucl. Soc., 53: 523-524(1986)			12:15832
	Trans. Am. Nucl. Soc., 53: 524-526(1986)			12:15833
	Trans. Am. Nucl. Soc., 53: 543-544(1986)			12:15834
	Trans. Am. Nucl. Soc., 53: 545-546(1986)			12:15835
	Trans. Am. Nucl. Soc., 53: 432-433(1986)			12:15840
	Trans. Am. Nucl. Soc., 53: 462-463(1986)			12:15841
	Trans. Am. Nucl. Soc., 53: 463-464(1986)			12:15842
	Trans. Am. Nucl. Soc., 53: 520-522(1986)			12:15843
	Trans. Am. Nucl. Soc., 53: 551-553(1986)			12:15844
	Trans. Am. Nucl. Soc., 53: 245-246(1986)			12:15858
	Trans. Am. Nucl. Soc., 53: 255-257(1986)			12:15859
	Trans. Am. Nucl. Soc., 53: 404(1986)			12:15860
	Trans. Am. Nucl. Soc., 53: 457-458(1986)			12:15861
	Trans. Am. Nucl. Soc., 53: 458-459(1986)			12:15862
	Trans. Am. Nucl. Soc., 53: 459-460(1986)			12:15863
	Trans. Am. Nucl. Soc., 53: 464(1986)			12:15864
	Trans. Am. Nucl. Soc., 53: 532-533(1986)			12:15865
	Trans. Am. Nucl. Soc., 53: 73(1986)			12:15905
	Trans. Am. Nucl. Soc., 53: 80-81(1986)			12:15906
	Trans. Am. Nucl. Soc., 53: 82-84(1986)			12:15907
	Trans. Am. Nucl. Soc., 53: 85-86(1986)			12:15908
	Trans. Am. Nucl. Soc., 53: 104(1986)			12:15909
	Trans. Am. Nucl. Soc., 53: 108(1986)			12:15910
	Trans. Am. Nucl. Soc., 53: 117-118(1986)			12:15911
	Trans. Am. Nucl. Soc., 53: 371(1986)			12:15912
	Trans. Am. Nucl. Soc., 53: 371-372(1986)			12:15913
	Trans. Am. Nucl. Soc., 53: 372-373(1986)			12:15914
	Trans. Am. Nucl. Soc., 53: 373(1986)			12:15915
	Trans. Am. Nucl. Soc., 53: 373-375(1986)			12:15916
	Trans. Am. Nucl. Soc., 53: 382(1986)			12:15917
	Trans. Am. Nucl. Soc., 53: 385(1986)			12:15918
	Trans. Am. Nucl. Soc., 53: 389-390(1986)			12:15919
	Trans. Am. Nucl. Soc., 53: 433-434(1986)			12:15920
	Trans. Am. Nucl. Soc., 53: 434-435(1986)			12:15921
	Trans. Am. Nucl. Soc., 53: 65-66(1986)			12:15922
	Trans. Am. Nucl. Soc., 53: 509(1986)			12:15923
	Trans. Am. Nucl. Soc., 53: 250-251(1986)			12:15928

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
	Trans. Am. Nucl. Soc., 53: 251-253(1986)			12:15929
	Trans. Am. Nucl. Soc., 53: 265-266(1986)			12:15930
	Trans. Am. Nucl. Soc., 53: 460-462(1986)			12:15931
	Trans. Am. Nucl. Soc., 53: 42-43(1986)			12:15932
	Trans. Am. Nucl. Soc., 53: 43-44(1986)			12:15933
	Trans. Am. Nucl. Soc., 53: 44-45(1986)			12:15934
	Trans. Am. Nucl. Soc., 53: 50-51(1986)			12:15935
	Trans. Am. Nucl. Soc., 53: 53(1986)			12:15936
	Trans. Am. Nucl. Soc., 53: 53-54(1986)			12:15937
	Trans. Am. Nucl. Soc., 53: 54-55(1986)			12:15938
	Trans. Am. Nucl. Soc., 53: 58-59(1986)			12:15939
	Trans. Am. Nucl. Soc., 53: 63-64(1986)			12:15940
	Trans. Am. Nucl. Soc., 53: 64-65(1986)			12:15941
	Trans. Am. Nucl. Soc., 53: 534-535(1986)			12:15942
	Trans. Am. Nucl. Soc., 53: 548-549(1986)			12:15943
	Trans. Am. Nucl. Soc., 53: 211-212(1986)			12:15950
	Trans. Am. Nucl. Soc., 53: 398-399(1986)			12:15951
	Trans. Am. Nucl. Soc., 53: 438(1986)			12:15952
	Trans. Am. Nucl. Soc., 53: 526-528(1986)			12:15953
	Trans. Am. Nucl. Soc., 53: 88-89(1986)			12:15956
	Trans. Am. Nucl. Soc., 53: 213-215(1986)			12:15957
	Trans. Am. Nucl. Soc., 53: 249-250(1986)			12:15963
	Trans. Am. Nucl. Soc., 53: 400-401(1986)			12:15964
	Trans. Am. Nucl. Soc., 53: 427-429(1986)			12:15969
	Trans. Am. Nucl. Soc., 53: 90-92(1986)			12:15996
	Trans. Am. Nucl. Soc., 53: 491-492(1986)			12:15997
	Trans. Am. Nucl. Soc., 53: 48-49(1986)			12:15998
	Trans. Am. Nucl. Soc., 53: 60-62(1986)			12:15999
	Trans. Am. Nucl. Soc., 53: 165-166(1986)			12:16000
	Trans. Am. Nucl. Soc., 53: 510-511(1986)			12:16001
	Trans. Am. Nucl. Soc., 53: 511-512(1986)			12:16002
	Trans. Am. Nucl. Soc., 53: 528-530(1986)			12:16003
	Trans. Am. Nucl. Soc., 53: 74(1986)			12:16065
	Trans. Am. Nucl. Soc., 53: 129(1986)			12:16066
	Trans. Am. Nucl. Soc., 53: 129-130(1986)			12:16067
	Trans. Am. Nucl. Soc., 53: 139(1986)			12:16068
	Trans. Am. Nucl. Soc., 53: 139-140(1986)			12:16069
	Trans. Am. Nucl. Soc., 53: 143-144(1986)			12:16070
	Trans. Am. Nucl. Soc., 53: 144(1986)			12:16071
	Trans. Am. Nucl. Soc., 53: 69(1986)			12:16072
	Trans. Am. Nucl. Soc., 53: 69-70(1986)			12:16073
	Trans. Am. Nucl. Soc., 53: 72(1986)			12:16074
	Trans. Am. Nucl. Soc., 53: 303-304(1986)			12:16075
	Trans. Am. Nucl. Soc., 53: 305-306(1986)			12:16076
	Trans. Am. Nucl. Soc., 53: 308-309(1986)			12:16077
	Trans. Am. Nucl. Soc., 53: 310-312(1986)			12:16078
	Trans. Am. Nucl. Soc., 53: 312-313(1986)			12:16079
	Trans. Am. Nucl. Soc., 53: 315-316(1986)			12:16080
	Trans. Am. Nucl. Soc., 53: 316-318(1986)			12:16081
	Trans. Am. Nucl. Soc., 53: 318-320(1986)			12:16082
	Trans. Am. Nucl. Soc., 53: 320-322(1986)			12:16083
	Trans. Am. Nucl. Soc., 53: 322-323(1986)			12:16084
	Trans. Am. Nucl. Soc., 53: 324-325(1986)			12:16085
	Trans. Am. Nucl. Soc., 53: 326-328(1986)			12:16086
	Trans. Am. Nucl. Soc., 53: 328-330(1986)			12:16087
	Trans. Am. Nucl. Soc., 53: 331-332(1986)			12:16088
	Trans. Am. Nucl. Soc., 53: 332-334(1986)			12:16089
	Trans. Am. Nucl. Soc., 53: 334-335(1986)			12:16090
	Trans. Am. Nucl. Soc., 53: 335-336(1986)			12:16091
	Trans. Am. Nucl. Soc., 53: 337-338(1986)			12:16092
	Trans. Am. Nucl. Soc., 53: 338-340(1986)			12:16093
	Trans. Am. Nucl. Soc., 53: 340-342(1986)			12:16094
	Trans. Am. Nucl. Soc., 53: 343-344(1986)			12:16095
	Trans. Am. Nucl. Soc., 53: 344-346(1986)			12:16096
	Trans. Am. Nucl. Soc., 53: 347-348(1986)			12:16097
	Trans. Am. Nucl. Soc., 53: 348-349(1986)			12:16098
	Trans. Am. Nucl. Soc., 53: 349-351(1986)			12:16099
	Trans. Am. Nucl. Soc., 53: 351-353(1986)			12:16100
	Trans. Am. Nucl. Soc., 53: 353(1986)			12:16101
	Trans. Am. Nucl. Soc., 53: 354-355(1986)			12:16102
	Trans. Am. Nucl. Soc., 53: 355-356(1986)			12:16103
	Trans. Am. Nucl. Soc., 53: 356-357(1986)			12:16104
	Trans. Am. Nucl. Soc., 53: 357-358(1986)			12:16105
	Trans. Am. Nucl. Soc., 53: 358-359(1986)			12:16106
	Trans. Am. Nucl. Soc., 53: 360-362(1986)			12:16107
	Trans. Am. Nucl. Soc., 53: 362-364(1986)			12:16108
	Trans. Am. Nucl. Soc., 53: 387-388(1986)			12:16109
	Trans. Am. Nucl. Soc., 53: 390-391(1986)			12:16110
	Trans. Am. Nucl. Soc., 53: 391-393(1986)			12:16111
	Trans. Am. Nucl. Soc., 53: 402-403(1986)			12:16112
	Trans. Am. Nucl. Soc., 53: 419-421(1986)			12:16113
	Trans. Am. Nucl. Soc., 53: 421-422(1986)			12:16114
	Trans. Am. Nucl. Soc., 53: 423-424(1986)			12:16115
	Trans. Am. Nucl. Soc., 53: 424-426(1986)			12:16116

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
	Trans. Am. Nucl. Soc., 53: 426-427(1986)			12:16117
	Trans. Am. Nucl. Soc., 53: 427(1986)			12:16118
	Trans. Am. Nucl. Soc., 53: 438-439(1986)			12:16119
	Trans. Am. Nucl. Soc., 53: 439-440(1986)			12:16120
	Trans. Am. Nucl. Soc., 53: 441-443(1986)			12:16121
	Trans. Am. Nucl. Soc., 53: 444-445(1986)			12:16122
	Trans. Am. Nucl. Soc., 53: 445-446(1986)			12:16123
	Trans. Am. Nucl. Soc., 53: 446-447(1986)			12:16124
	Trans. Am. Nucl. Soc., 53: 447-449(1986)			12:16125
	Trans. Am. Nucl. Soc., 53: 166-167(1986)			12:16126
	Trans. Am. Nucl. Soc., 53: 502-503(1986)			12:16127
	Trans. Am. Nucl. Soc., 53: 503-504(1986)			12:16128
	Trans. Am. Nucl. Soc., 53: 504-505(1986)			12:16129
	Trans. Am. Nucl. Soc., 53: 505-506(1986)			12:16130
	Trans. Am. Nucl. Soc., 53: 507-(1986)			12:16131
	Trans. Am. Nucl. Soc., 53: 530-531(1986)			12:16132
	Trans. Am. Nucl. Soc., 53: 531-532(1986)			12:16133
	Trans. Am. Nucl. Soc., 53: 537-539(1986)			12:16134
	Trans. Am. Nucl. Soc., 53: 540-541(1986)			12:16135
	Trans. Am. Nucl. Soc., 53: 541-543(1986)			12:16136
	Trans. Am. Nucl. Soc., 53: 553-555(1986)			12:16137
	Trans. Am. Nucl. Soc., 53: 555-556(1986)			12:16138
	Trans. Am. Nucl. Soc., 53: 557-558(1986)			12:16139
	Trans. Am. Nucl. Soc., 53: 558-559(1986)			12:16140
	Trans. Am. Nucl. Soc., 53: 559-601(1986)			12:16141
	Trans. Am. Nucl. Soc., 53: 561-562(1986)			12:16142
	Trans. Am. Nucl. Soc., 53: 562-563(1986)			12:16143
	Trans. Am. Nucl. Soc., 53: 62-63(1986)			12:16164
	Trans. Am. Nucl. Soc., 53: 366-367(1986)			12:16176
	Trans. Am. Nucl. Soc., 53: 367(1986)			12:16177
	Trans. Am. Nucl. Soc., 53: 367-368(1986)			12:16178
	Trans. Am. Nucl. Soc., 53: 368(1986)			12:16179
	Trans. Am. Nucl. Soc., 53: 370-371(1986)			12:16180
	Trans. Am. Nucl. Soc., 53: 119(1986)			12:16447
	Trans. Am. Nucl. Soc., 53: 414-415(1986)			12:16448
	Trans. Am. Nucl. Soc., 53: 415(1986)			12:16449
	Trans. Am. Nucl. Soc., 53: 416(1986)			12:16450
	Trans. Am. Nucl. Soc., 53: 486(1986)			12:16451
	Trans. Am. Nucl. Soc., 53: 486-488(1986)			12:16452
	Trans. Am. Nucl. Soc., 53: 488-489(1986)			12:16453
	Trans. Am. Nucl. Soc., 53: 494-495(1986)			12:16454
	Trans. Am. Nucl. Soc., 53: 495-496(1986)			12:16455
	Trans. Am. Nucl. Soc., 53: 496-497(1986)			12:16456
	Trans. Am. Nucl. Soc., 53: 497-498(1986)			12:16457
	Trans. Am. Nucl. Soc., 53: 499-501(1986)			12:16458
	Trans. Am. Nucl. Soc., 53: 509-510(1986)			12:16459
	Trans. Am. Nucl. Soc., 53: 518-519(1986)			12:16460
	Trans. Am. Nucl. Soc., 53: 519-520(1986)			12:16461
	Trans. Am. Nucl. Soc., 53: 254-255(1986)			12:16479
	Trans. Am. Nucl. Soc., 53: 257-258(1986)			12:16480
	Trans. Am. Nucl. Soc., 53: 261-263(1986)			12:16481
	Trans. Am. Nucl. Soc., 53: 55-56(1986)			12:16482
	Trans. Am. Nucl. Soc., 53: 410-412(1986)			12:16518
	Trans. Am. Nucl. Soc., 53: 408-409(1986)			12:16661
	Trans. Am. Nucl. Soc., 53: 59-60(1986)			12:16662
	Trans. Am. Nucl. Soc., 53: 147-148(1986)			12:16663
	Trans. Am. Nucl. Soc., 53: 148-149(1986)			12:16664
	Trans. Am. Nucl. Soc., 53: 149-151(1986)			12:16665
	Trans. Am. Nucl. Soc., 53: 151-152(1986)			12:16666
	Trans. Am. Nucl. Soc., 53: 152-153(1986)			12:16667
	Trans. Am. Nucl. Soc., 53: 153-154(1986)			12:16668
	Trans. Am. Nucl. Soc., 53: 163(1986)			12:16669
	Trans. Am. Nucl. Soc., 53: 70-71(1986)			12:16769
	Trans. Am. Nucl. Soc., 53: 412-413(1986)			12:17122
	Trans. Am. Nucl. Soc., 53: 409-410(1986)			12:17327
	Trans. Am. Nucl. Soc., 53: 416-419(1986)			12:17328
33	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004965	MN -79	12:15980
36	*See* BNL-NCS-38907	E 1.99: DE87004605	MN -34C	12:17216
CONF-861111-	(Conference on magnetism and magnetic materials, Baltimore, MD, USA, 17-21 Nov 1986)			
18	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004744	MN -25	12:16254
19	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004724	MN -25	12:16255
20	*See* BNL-39054	E 1.99: DE87004246	MN -34A	12:17337
21	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004698	MN -34A	12:17339
CONF-861114-	(9. international conference on application of accelerators in research and industry, Denton, TX, USA, 10-12 Nov 1986)			
27	*See* LBL-22261	E 1.99: DE87002544	MN -25	12:15760
28	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87002811	MN -28	12:16591
37	*See* LBL-22282	E 1.99: DE87003539	MN -34A	12:17081
38	*See* SAND-86-1382C	E 1.99: DE87004521	MN -21	12:17487
39	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004683	MN -28	12:16539
40	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004686	MN -28	12:16540
42	*See* BNL-38963	E 1.99: DE87005250	MN -34A	12:17058

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
43	*See* BNL-39104	E 1.99: DE87005252	MN -48	12:16595
44	*See* BNL-38938	E 1.99: DE87005251	MN -28	12:16533
45	*See* BNL-39109	E 1.99: DE87005243	MN -28	12:16535
46	*See* BNL-39105	DE87005244	MN -28	12:16534
53	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004754	MN -28	12:16541
CONF-861123-	(CEC/CEA international workshop on age-related factors in radionuclide metabolism and dosimetry, Angers, France, 26-28 Nov 1986)			
3	*See* PNL-SA-14209	E 1.99: DE87004465	MN -41	12:16878
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004689	MN -41	12:16855
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004711	MN -41	12:16856
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004694	MN -48	12:16857
CONF-861128-	(10. scientific meeting of the Society for Reactor Safety, Cologne, F.R. Germany, 12-13 Nov 1986)			
1	*See* N-87-11790			12:16228
CONF-861146-	(AIChE winter annual meeting, Miami, FL, USA, 2-7 Nov 1986)			
14	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004746	MN -86	12:15383
CONF-861177-	(9. international conference on lasers and applications, Orlando, FL, USA, 3-7 Nov 1986)			
4	*See* LA-UR-86-4153	E 1.99: DE87003728	MN -34	12:17411
5	*See* SAND-86-2121C	E 1.99: DE87005060	MN -34	12:16467
6	*See* LA-UR-87-83	E 1.99: DE87005113	MN -34	12:16466
CONF-861185-	(Reduced Enrichment for Research and Test Reactors (RERTR) program international meeting, Gatlinburg, TN, USA, 3-6 Nov 1986)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004830	MN -25	12:16256
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004685	MN -83	12:15869
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004752	MN -80	12:15981
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004751	MN -80	12:15982
CONF-861193-	(IAEA specialists' meeting on covariance methods and practices in the field of nuclear data, Rome, Italy, 17-19 Nov 1986)			
2	NTIS, PC A02; 3	DE87004688	MN -32	12:17192
3	*See* LA-UR-86-3786	E 1.99: DE87002917	MN -32	12:17202
4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004748	MN -34C	12:17256
CONF-8611103-	(20. symposium of North Eastern Accelerator Personnel)			
5	*See* DOE/ER/40124-10	E 1.99: DE87003132	MN -28	12:16543
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004695	MN -28	12:16508
CONF-8611109-	(IAEA technical committee meeting on water reactor fuel behaviour and fission products release in off-normal and accident conditions, Vienna, Austria, 10-13 Nov 1986)			
1	*See* EGG-M-36186	E 1.99: DE87004536	MN -78	12:16027
3	NTIS (US Sales Only), PC A02/MF A01; 1	DE87900498	MN -78	12:16021
4	*See* IAEA-TC-579-31	DE87900500	MN -78	12:16034
5	NTIS (US Sales Only), PC A02; 3	DE87900497	MN -78	12:15797
7	NTIS (US Sales Only), PC A02; 3	DE87900501	MN -78	12:16022
8	*See* IAEA-TC-579/42	DE87900503	MN -78	12:16035
9	NTIS (US Sales Only), PC A03; 3	DE87900493	MN -78	12:16023
11	*See* IAEA-TC-579-24	DE87900499	MN -78	12:16033
CONF-8611111-	(Taniguchi symposium on Quantum Monte Carlo, Shizuoka, Japan, 13-18 Nov 1986)			
1	*See* LA-UR-86-3745	E 1.99: DE87002927	MN -32	12:17350
CONF-8611115-	(Nuclear explosives code development conference, Albuquerque, NM, USA, 17-20 Nov 1986)			
2	*See* UCRL-95652	E 1.99: DE87003520	MN -32	12:17659
CONF-8611116-	(Nuclear explosives code developers conference, Albuquerque, NM, USA, 16-20 Nov 1986)			
3	*See* UCRL-95946	DE87005053	MN -34C	12:17326
CONF-8611117-	(Annual meeting of the Society for Risk Analysis, Boston, MA, USA, 9-12 Nov 1986)			
1	*See* LA-UR-86-4113	E 1.99: DE87003720	MN -15	12:15565
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005363	MN -13	12:16912
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004279	MN -13	12:16913
CONF-8611120-	(Seminar on BWR corrosion, chemistry, and radiation control, Palo Alto, CA, USA, 10-12 Nov 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004701	MN -78	12:15766
CONF-8611121-	(Conference on chemical defense research, Aberdeen Proving Grounds, MD, USA, 15 Nov 1986, 15 Nov 1986)			
1	*See* UCRL-94676	E 1.99: DE87003239	MN -41	12:16916
CONF-8611122-	(Monthly meeting of San Juan Island Chapter of the Daughters of the American Revolution, Friday Harbor, WA, USA, 11 Nov 1986, 11 Nov 1986)			
1	*See* PNL-SA-14407	E 1.99: DE87002709	MN -13	12:17631
CONF-8611125-	(4. advanced coal gasification symposium, Su Zhou, China, 2-10 Nov 1986)			
1	Institute of Gas Technology, 3424 South State St., Chicago, IL 60616	TI87900455	MN -90c	12:15275

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-861204-	(4. Miami international symposium on multi-phase transport and particulate phenomena, Miami Beach, FL, USA, 15-17 Dec 1986)				
3	*See* EGG-M-32686		DE87004541	MN -78	12:16026
4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004833	MN -95d	12:16200
5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004706	MN -78	12:16017
CONF-861207-	(Materials Research Society fall meeting, Boston, MA, USA, 1-5 Dec 1986)				
43	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE8700[illegible]684	MN -25	12:16257
44	*See* BNL-39096	E 1.99:	DE87004606	MN -25	12:16241
45	*See* LA-UR-86-4339	E 1.99:	DE87003755	MN -34A	12:17352
46	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004621	MN -25	12:16258
47	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004872	MN -70	12:15413
48	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004721	MN -25	12:16259
49	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004835	MN -25	12:16260
50	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004722	MN -25	12:16261
51	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004723	MN -25	12:16262
52	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004866	MN -70	12:16263
53	*See* SAND-86-2414C	E 1.99:	DE87005059	MN -25	12:15448
55	*See* BNL-39052		DE87005248	MN -25	12:16240
56	*See* PNL-SA-14054	E 1.99:	DE87004923	MN -70	12:15447
58	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87005340	MN -25	12:16264
60	*See* N-87-12679				12:16362
62	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004704	MN -25	12:16329
CONF-861211-	(American Society of Mechanical Engineers winter meeting, Anaheim, CA, USA, 7-12 Dec 1986)				
22	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004826	MN -79	12:15851
CONF-861244-	(ACM SIGCHI workshop on mixed modes of interaction, Key West, FL, USA, 15-17 Dec 1986)				
1	*See* UCRL-95588	E 1.99:	DE87002755	MN -20a	12:17489
CONF-861246-	(Workshop on numerical modeling for radioactive waste repositories, Madrid, Spain, 10-12 Dec 1986)				
1	*See* LBL-22559	E 1.99:	DE87004477	MN -70	12:16919
CONF-861247-	(5. simposio Chiceno de Fisica, Santiago, Chile, 18-20 Dec 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87001941	MN -34	12:17358
CONF-861250-	(IAEA advisory group meeting on nuclear data for fusion reactor technology, Dresden, German D.R., 1-5 Dec 1986)				
1	*See* LA-UR-86-3705	E 1.99:	DE87002929	MN -20d	12:17484
CONF-861251-	(American Society of Mechanical Engineers winter annual meeting, New York, NY, USA, 8-12 Dec 1986)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004825	MN -90	12:15326
CONF-870124-	(General meeting of the American Physical Society, San Francisco, CA, USA, 28-31 Jan 1987)				
1	*See* UCRL-95825	E 1.99:	DE87003815	MN -2	12:16684
CONF-870133-	(25. AIAA aerospace sciences meeting, Reno, NV, USA, 12-15 Jan 1987)				
3	*See* N-87-11838				12:15624
CONF-870134-	(Workshop on space telerobotics, Pasadena, CA, USA, 20-22 Jan 1987)				
1	NTIS, PC A02; 3		DE87004257	MN -38	12:16440
CONF-870136-	(12. workshop on geothermal reservoir engineering, Stanford, CA, USA, 20-22 Jan 1987)				
4	*See* SAND-87-0073C		DE87005068	MN -66a	12:15630
CONF-870138-	(4. international symposium on halide glasses, Monterey, CA, USA, 26-29 Jan 1987)				
1	*See* SAND-86-2126C		DE87003789	MN -2[illegible]	12:16334
CONF-870142-	(5. international conference on valence fluctuations, Bangalore, India, 5-9 Jan 1987)				
3	*See* LA-UR-87-15	E 1.99:	DE87005126	MN -25	12:16284
4	*See* LA-UR-87-16	E 1.99:	DE87005125	MN -25	12:16285
CONF-870144-	(International solid state physics workshop, Santiago, Chile, 1-16 Jan 1987)				
1	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004421	MN -34	12:17340
CONF-870203-	(Power Engineering Society winter meeting, New Orleans, LA, USA, 1-6 Feb 1987)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87002422	MN -97	12:15666
CONF-870219-	(Midyear topical symposium of the Health Physics Society: health physics of radiation-producing machines, Reno, NV, USA, 8-12 Feb 1987)				
3	*See* EGG-M-19086	E 1.99:	DE87002100	MN -34A	12:17330
6	*See* FNAL/C-86/156		DE87003854	MN -28	12:16549
8	*See* SLAC-PUB-4203		DE87005596	MN -34D	12:17325
9	*See* SLAC-PUB-4179	E 1.99:	DE87004898	MN -28	12:16516
CONF-870252-	(Solving ground water problems with models conference, Denver, CO, USA, 10-12 Feb 1987)				
1	*See* SAND-87-7001C	E 1.99:	DE87005064	MN -70	12:16921
CONF-870253-	(Industrial environmental management conference, Hilton Head, SC, USA, 25-27 Feb 1987)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87005686	MN -61E	12:15586

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
CONF-870301-	(International topical meeting on remote systems and robotics in hostile environments, Pasco, WA, USA, 29 Mar-2 Apr 1987)			
6	NTIS, PC A02/MF A01	DE87003005	MN -38	12:16441
10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004062	MN -20	12:17432
18	*See* HEDL-SA-3534-FP	DE87005480	MN -79	12:15377
CONF-870306-	(Waste management '87, Tucson, AZ, USA, 1-5 Mar 1987)			
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004620	MN -70B	12:15414
6	NTIS, PC A02; 3	DE87005330	MN -70	12:15415
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005338	MN -85	12:15416
8	NTIS, PC A02; 3	DE87005341	MN -70	12:15417
11	NTIS, PC A02; 3	DE87005384	MN -70	12:15418
CONF-870307-	(ASME/JSME/ISES solar energy conference, Honolulu, HI, USA, 22-27 Mar 1987)			
10	*See* SAND-86-2181C	E 1.99: DE87003511	MN -63	12:15611
CONF-870314-	(Corrosion '87, San Francisco, CA, USA, 9-13 Mar 1987)			
5	*See* SAND-86-2814C	DE87003155	MN -25	12:16296
7	*See* SAND-86-2856C	E 1.99: DE87003788	MN -25	12:16297
CONF-870316-	(38. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy, Atlantic City, NJ, USA, 9-13 Mar 1987)			
1	*See* WAPD-T-2873	E 1.99: DE87000912	MN -32	12:16395
CONF-870335-	(International conference on radiation dosimetry and safety, Taipei, China, 2-4 Mar 1987)			
1	*See* UCRL-95082	E 1.99: DE87004355	MN -41	12:16879
CONF-870355-	(Computer graphics '87 conference, Philadelphia, PA, USA, 22-26 Mar 1987)			
3	NTIS, PC A02; 3	DE87005509	MN -32	12:17642
CONF-870371-	(ID EXPO meeting, Long Beach, CA, USA, 25-27 Mar 1987)			
1	*See* DP-MS-86-137	E 1.99: DE87004514	MN -32	12:17648
CONF-870373-	(National conference on microcomputer applications for renewable energy, Honolulu, HI, USA, 3-4 Mar 1987)			
1	*See* SAND-86-0272C	E 1.99: DE87002052	MN -63	12:15617
CONF-870374-	(International symposium on the interaction of conventional munitons with protective structures, Mannheim, F.R. Germany, 9-13 Mar 1987)			
1	*See* LA-UR-87-78	E 1.99: DE87004500	MN -45	12:16678
CONF-870505-	(32. international gas turbine conference and exhibition, Anaheim, CA, USA, 31 May-4 Jun 1987)			
2	*See* N-87-12910			12:16333
CONF-870816-	(Thermal hydraulics of severe nuclear reactor accidents/national heat transfer conference joint conference, Pittsburgh, PA, USA, 9-12 Aug 1987)			
1	*See* SAND-86-2553C	E 1.99: DE87004517	MN -45	12:16679
CRIEPI-				
285076	NTIS			12:15318
484007	NTIS			12:15344
484014	NTIS			12:15309
CRN-CPR-				
84-1	NTIS (US Sales Only), PC A03/MF A01	DE87750453	MN -37	12:16602
CRN-PN-				
84-44	NTIS (US Sales Only), PC A03/MF A01	DE87750454	MN -34C	12:17218
CSIRO-DG-GCM-				
63	NTIS			12:15320
64	NTIS			12:15321
D-				
16:1986	*See* PB-87-109179/XAB			12:16227
17:1986	*See* PB-87-108759/XAB			12:16206
DFVLR-FB-				
85-36	*See* ESA-TT-61			12:15621
DOE/BC-				
86/ 1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE86000294	STD -92a	12:15353
DOE/BC/10828-				
2	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87005347	MN -92	12:17633
DOE/CE/10156-				
1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87004910	MN -95d	12:16201
DOE/CE/63487-				
T2	NTIS, PC A05; 3	DE87004906	MN -95e	12:15595
DOE/CH/10272-				
1	NTIS, PC A03; 3	DE87004645	MN -70	12:15419
DOE/CH/10276-				
1	NTIS, PC A02; 3	DE87004324	MN -70	12:15420
DOE/CH/10282-				
1	NTIS, PC A05; 3	DE87004325	MN -70	12:15421
DOE/DP/48013-				
T1	NTIS, PC A11; 3	DE87004644	MN -16	12:15563
DOE/DP/50053-				
T1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87004140	MN -2	12:16162
DOE/DP/93032-				
T1	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99: DE87003893	MN -70A	12:15560

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
DOE/EIA-				
0206(85)	NTIS, PC A07/MF A01 - GPO; 1 (GPO Dep.)	E 1.99: DE87004814	MN -98F	12:16155
0226(86/ 10)	NTIS, PC A03/MF A01 - GPO; 1 (GPO Dep.)	E 1.99: DE87004812	MN -98E	12:16172
DOE/EIS-				
126-F-Vol.1	NTIS, PC A20/MF A01; 1	DE87005502	MN -70A	12:15561
126-F-Vol.2	NTIS, PC A15	DE87005555	MN -70A	12:15562
DOE/ER/03231-				
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005183	MN -48	12:15602
DOE/ER/03244-				
134	NTIS, PC A02; 3	DE87003929	MN -34C	12:17098
DOE/ER/10005-				
T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004416	MN -20f	12:17400
DOE/ER/10420-				
8	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005092	MN -34C	12:17209
DOE/ER/10514-				
T3	NTIS, PC A02; 3	DE87004407	MN -34A	12:17068
DOE/ER/10690-				
7	NTIS, PC A02; 3	DE87005171	MN -34D	12:17099
DOE/ER/10694-				
1-Final	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87003413	MN -4	12:16420
DOE/ER/13007-				
1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004646	MN -34	12:17342
DOE/ER/13247-				
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003994	MN -4	12:16423
DOE/ER/13326-				
T2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004850	MN -34A	12:17069
DOE/ER/13357-				
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003910	MN -34A	12:16384
DOE/ER/25009-				
290B	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005035	MN -32	12:17645
371	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005033	MN -34D	12:17343
378	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005030	MN -32	12:17646
388	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005026	MN -32	12:16682
DOE/ER/40124-				
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87003132	MN -28	12:16543
12	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005551	MN -28	12:16522
DOE/ER/40154-				
3	NTIS, PC A02; 3	DE87005520	MN -34C	12:17258
DOE/ER/40159-				
113	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004849	MN -34C	12:17193
DOE/ER/40226-				
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005302	MN -34D	12:17161
DOE/ER/40257-				
001	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004418	MN -34D	12:17100
DOE/ER/45056-				
3	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE87005359	MN -25	12:16351
4	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005358	MN -25	12:16352
5	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005355	MN -25	12:16353
DOE/ER/45091-				
3	NTIS, PC A02; 3	DE87005658	MN -25	12:16265
DOE/ER/45107-				
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003822	MN -4	12:16402
DOE/ER/45116-				
16	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005360	MN -25	12:16266
17	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87005361	MN -25	12:16267
18	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005362	MN -25	12:16354
DOE/ER/45255-				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004300	MN -25	12:16268
DOE/ER/45258-				
1	NTIS MF A01; 2	DE87004295	MN -25	12:16355
DOE/ER/60348-				
5	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005303	MN -11	12:16933
DOE/ER/60435-				
T2	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87004385	MN -11	12:16934
DOE/ER/72012-				
T4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004914	MN -32	12:17087
DOE/ET/15601-				
8	Minerals Management Service, 18th and C Streets, NW, Washington, DC 20240	DE87005005	MN -90g	12:16186
DOE/ET/53088-				
267	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004852	MN -20	12:17401
DOE/FE-				
0078	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005803	MN -90e	12:15327
0079	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005573	MN -90	12:15266
0081	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005593	MN -13	12:16168
DOE/FE/60177-				
2224	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87002264	MN -91	12:15375
DOE/FE/60181-				
2271	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE87005885	MN -90	12:15310
DOE/ID/12514-				
T1	NTIS, PC A15/MF A01; 1 (GPO Dep.)	E 1.99: DE87005349	MN -70B	12:15422
DOE/ID/12543-				
2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004787	MN -66a	12:15625

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
DOE/JPL-1012-113	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87005419	MN -63b	12:15603
1012-115	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE87005420	MN -63b	12:17647
1012-120	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005424	MN -63b	12:15604
1012-121	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005425	MN -63b	12:15605
1012-123	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005427	MN -63b	12:15606
DOE/JPL/1060-96	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005431	MN -62	12:15619
DOE/JPL/957031-86-Final	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99: DE87004786	MN -63b	12:15607
DOE/MA-0269	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005591	MN -13	12:17634
DOE/MC/12841-2254	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005021	MN -93A	12:16193
DOE/MC/19281-T1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99: DE86004249	MN -93	12:15680
DOE/MC/20050-2226	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE87001035	STD -90c	12:15276
DOE/MC/20230-T5	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86011514	MN -92a	12:15277
DOE/MC/21004-T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007605	MN -90c	12:15278
T4	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86010427	MN -90c	12:15279
T5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86013230	MN -90c	12:15280
DOE/MC/22044-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005310	MN -92a	12:15355
DOE/MC/22059-2268	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87003927	MN -90c	12:15281
DOE/METC-87/ 6073	NTIS, PC A23/MF A01; 1 (GPO Dep.)	E 1.99: DE87001002	MN -91	12:15371
DOE/OR/00033-T251	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004590	MN -70	12:15423
T252	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004879	MN -2	12:15924
T253	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87004880	MN -98C	12:15366
T254	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004878	MN -70	12:15424
T259	NTIS, PC A02/MF A01; 1	DE87004885	MN -95f	12:16217
T263	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87004891	MN -95f	12:16218
T268	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004886	MN -97	12:16219
T269	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004888	MN -97	12:16220
DOE/OR/21400-T283	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005332	MN -48	12:16811
T286	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005597	MN -97b	12:16173
DOE/PC/60039-11	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004912	MN -90d	12:15301
DOE/PC/63032-T16	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005394	MN -90b	12:15282
DOE/PC/72008-T8	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005382	MN -90b	12:15283
DOE/PC/80016-T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005037	MN -90d	12:15284
DOE/PC/80023-T7	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004902	MN -90d	12:15285
DOE/PC/80505-T5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004588	MN -90d	12:15302
DOE/PC/80524-T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005039	MN -90a	12:15324
DOE/PC/80526-T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005181	MN -90a	12:15286
DOE/PC/80529-T4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005025	MN -90a	12:15303
DOE/PC/80533-T5	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87004911	MN -90a	12:15304
DOE/PC/80536-T5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005608	MN -90a	12:16403
DOE/PC/90529-1	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87004915	MN -90a	12:15287
DOE/PC/90751-T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005018	MN -90a	12:15328
DOE/PC/90957-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004507	MN -90d	12:16474
DOE/UNDERC/QTR-86/ 2	*See* DOE/FE/60181-2271	E 1.99: DE87005885	MN -90	12:15310
DOE/WIPP-86-006	NTIS, PC A18/MF A01; 1 (GPO Dep.)	E 1.99: DE87005590	MN -70	12:15488
DOT-TSC-UMTA-82-15	*See* PB-87-112108/XAB			12:16213
82-47	*See* PB-87-112082/XAB			12:16211
83-30	*See* PB-87-112090/XAB			12:16212
83-46	*See* PB-87-112116/XAB			12:16214
84-37	*See* PB-87-112074/XAB			12:16210
DP-1673	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005575	STD -10	12:15385
1709	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005568	STD -37	12:15376
1718	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99: DE87005569	STD -41	12:15386

Report Number	*Availability Source*	*File Number*		*Distribution Category*	*Abstract Number*
1728	NTIS, PC A06; 3		DE87004515	STD -70	12:16356
DP-MS-					
86-137	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004514	MN -32	12:17648
86-167	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004187	MN -10	12:15387
DPST-					
85-547	NTIS, PC A07; 3		DE87004516	MN -70	12:15425
E-					
3263	*See* N-87-11893				12:16360
3276	*See* N-87-12910				12:16333
3281	*See* N-87-11838				12:15624
3286	*See* N-87-11790				12:16228
3297	*See* N-87-11875				12:16288
3323	*See* N-87-12679				12:16362
EDF-DER-RA-					
1985-1	NTIS (US Sales Only), PC A09/MF A01		DE87750539	MN -78	12:15798
EFI-					
735(50) -84	NTIS (US Sales Only), PC A04/MF A01		DE87700669	MN -37	12:16603
774(1) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700670	MN -34A	12:17344
775(2) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700671	MN -34D	12:17359
776(3) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700672	MN -28	12:16544
777(4) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700673	MN -28	12:16523
779(6) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700674	MN -28	12:16545
780(7) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700675	MN -34C	12:17306
781(8) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700676	MN -34C	12:17259
782(9) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700677	MN -34D	12:17101
784(11) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700678	MN -28	12:16546
787(14) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700679	MN -34A	12:17070
788(15) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700680	MN -34B	12:16942
789(16) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700681	MN -37	12:16604
790(17) -85	NTIS (US Sales Only), PC A03/MF A01		DE87700682	MN -28	12:16547
792(19) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700683	MN -37	12:16605
793(20) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700684	MN -28	12:16548
794(21) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700685	MN -37	12:16606
796(23) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700686	MN -34D	12:17102
800(27) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700687	MN -28	12:16592
803(30) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700688	MN -37	12:16607
811(38) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700689	MN -34D	12:17129
813(40) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700690	MN -37	12:16608
819(46) -85	NTIS (US Sales Only), PC A02/MF A01		DE87700691	MN -37	12:16609
EGG-					
2491	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004884	STD -71	12:15397
10282-1122	NTIS, PC A02/MF AO1; 1 (GPO Dep.)	E 1.99:	DE87002863	MN -41	12:16914
EGG-M-					
18286	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87000439	MN -25	12:16269
19086	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87002100	MN -34A	12:17330
25986	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004535	MN -78	12:16024
27686	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004534	MN -78	12:16025
32686	NTIS, PC A02 - GPO; 3		DE87004541	MN -78	12:16026
36186	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004536	MN -78	12:16027
EGG-NERD-					
7444	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004540	MN -71	12:15398
EGG-PHY-					
7223	NTIS, PC A02/MF A01; 1		DE87004530	MN -92	12:16923
EIR-					
601	NTIS (US Sales Only), PC A02/MF A01		DE87700692	MN -80	12:15925
EPA-					
450/ 3-86/ 004	*See* PB-87-113882/XAB				12:16771
450/ 4-86/ 008	*See* PB-86-210598/XAB				12:16712
600/ 4-86/ 031	*See* PB-87-111720/XAB				12:16720
600/ D-86/ 248	*See* PB-87-112330/XAB				12:16721
EPRI-AP-					
5029	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920251	ND -90c	12:15288
EPRI-CS-					
5013	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920233	ND -25	12:15736
EPRI-EL-					
2000-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920255	ND -97c	12:15754
2001-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920257	ND -97c	12:15755
2002-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920263	ND -97c	12:15756
2003-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920258	ND -97c	12:15757
2004-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920256	ND -97c	12:15758
4610	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920254	ND -97	12:15759
5003-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920237	ND -97b	12:16174
EPRI-EM-					
4882-CCM	Research Reports Center, Box 50490, Palo Alto, CA 94303		TI87920241	ND -97c	12:16181

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
4988-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920211	ND -95f	12:16182
EPRI-NP-				
4222-Vol.3	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920215	ND -78	12:15948
4222-Vol.5	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920217	ND -78	12:15768
4574-CCM-Pt.2-Ch.2-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920247	ND -78	12:15777
4574-CCM-Pt.2-Ch.7-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920228	ND -78	12:15774
4574-CCM-Pt.2-Ch.12-Vol.3	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920248	ND -78	12:15775
4817	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920218	ND -78	12:15769
4924-Vol.2	NTIS, PC A05/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303; 1 (GPO Dep.)	E 1.99: DE87005443	MN -79	12:16028
4991	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920221	ND -78	12:16029
4999	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920222	ND -78	12:16030
5001	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920224	ND -78	12:15770
5008	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920225	ND -78	12:15771
5015	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI87920244	ND -25	12:15799
ESA-CR(P)-				
262	NTIS, PC A04/MF A01			12:16270
2236	*See* ESA-ESTL-7			12:16436
ESA-ESTL-				
7	NTIS, PC A02/MF A01			12:16436
ESA-TT-				
61	NTIS, PC A03/MF A01; original German version avail. at DFVLR, Cologne, West Germany DM 15			12:15621
ESC-WR-				
86-16	Energie Studie Centrum ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -11	12:16208
86-18	Energie Studie Centrum ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -98	12:16152
ETN-				
86-98114	*See* ESA-ESTL-7			12:16436
86-98147	*See* ESA-CR(P)-262			12:16270
86-98246	*See* ESA-TT-61			12:15621
ETSU-WV-				
1668(P3)	British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ		ND -97e	12:15631
EUR-				
9772	NTIS (US Sales Only), PC A12/MF A01	DE87750550	MN -70	12:16358
10026	NTIS (US Sales Only), PC A20/MF A01	DE87750542	MN -70	12:16385
10043	NTIS (US Sales Only), PC A05/MF A01	DE87750543	MN -78	12:15772
10107	NTIS (US Sales Only), PC A05/MF A01	DE87750552	MN -71	12:16442
10124	NTIS (US Sales Only), PC A03/MF A01	DE87750548	MN -25	12:16271
10125	NTIS (US Sales Only), PC A03/MF A01	DE87750547	MN -25	12:16272
10126	NTIS (US Sales Only), PC A09/MF A01	DE87750540	MN -79h	12:16273
10189	NTIS (US Sales Only), PC A02/MF A01	DE87750549	MN -34C	12:16386
10293	NTIS (US Sales Only), PC A08/MF A01	DE87750553	MN -70	12:15426
10382	NTIS (US Sales Only), PC A08/MF A01	DE87750545	MN -70	12:15427
10411	NTIS (US Sales Only), PC A04/MF A01	DE87750546	MN -70	12:15428
10441	NTIS (US Sales Only), PC A07/MF A01	DE87750544	MN -70	12:16387
10444	NTIS (US Sales Only), PC A07/MF A01	DE87750586	MN -4	12:16429
10445	NTIS (US Sales Only), PC A04/MF A01	DE87750551	MN -4	12:16388
10491	NTIS (US Sales Only), PC A07/MF A01	DE87750555	MN -10	12:15429
10503	NTIS (US Sales Only), PC A06/MF A01	DE87750541	MN -22	12:16389
FDA/OMO-				
87/ 10D	*See* PB-87-920999/XAB			12:16911
FEI-				
1548	NTIS (US Sales Only), PC A02/MF A01	DE87701282	MN -34A	12:17307
1551	NTIS (US Sales Only), PC A02/MF A01	DE87700693	MN -34C	12:17308
1554	NTIS (US Sales Only), PC A03/MF A01	DE87700694	MN -46	12:17309
1630	NTIS (US Sales Only), PC A03/MF A01	DE87700695	MN -46	12:17310
1632	NTIS (US Sales Only), PC A02/MF A01	DE87700696	MN -37	12:16610
1657	NTIS (US Sales Only), PC A02/MF A01	DE87700697	MN -25	12:16274
1663	NTIS (US Sales Only), PC A02/MF A01	DE87700698	MN -37	12:16671
1722	NTIS (US Sales Only), PC A02/MF A01	DE87700699	MN -34C	12:17213
FLOW/TR-				
306/ 09-84	*See* PB-87-117156/XAB			12:16725
FNAL/C-				
86/ 156	NTIS, PC A02/MF A01; 1	DE87003854	MN -28	12:16549
86/ 166	*See* SLAC-PUB-4144	DE87004559	MN -34D	12:17155

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
FNAL-TM-				
1428	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005559	MN -48	12:16812
1434	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005561	STD -28	12:16611
1436	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005562	STD -95	12:16550
1437	NTIS, PC AA02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005563	STD -28	12:16551
FR-				
19269	*See* N-87-11889			12:16289
FS-				
86-38-AKD	*See* PTB-Dos-14	DE87750519	MN -41	12:16649
FSRP-SE-				
256	*See* PB-87-122156/XAB			12:16728
GANIL-P-				
86-02	NTIS (US Sales Only), PC A02/MF A01	DE87750584	MN -34C	12:17219
86-08	NTIS (US Sales Only), PC A02/MF A01	DE87750590	MN -34C	12:17260
86-09	NTIS (US Sales Only), PC A03/MF A01	DE87750583	MN -34C	12:17243
86-12	NTIS (US Sales Only), PC A02/MF A01	DE87750582	MN -34C	12:17236
GB-				
55	British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ		ND -66a	12:15626
56	British Library, Document Supply Centre, Boston Spa, Wetherby, West Yorks LS23 7BQ		ND -66a	12:15628
GEND-				
058	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87005195	STD -78	12:15800
GEPP-TIS-				
366d	NTIS, PC A15/MF A01; 1 (GPO Dep.)	E 1.99: DE87004165	MN -13	12:15667
GSF-				
16/ 86	NTIS (US Sales Only), PC A03/MF A01	DE87750509	MN -11	12:16768
GSI-				
86-16	NTIS (US Sales Only), PC A04/MF A01	DE87750513	MN -37	12:16612
86-31-Prepr.	NTIS (US Sales Only), PC A03/MF A01	DE87750501	MN -34A	12:17071
86-32-Prepr.	NTIS (US Sales Only), PC A02/MF A01	DE87750500	MN -34C	12:17261
HEDL-				
7612	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87005494	MN -70	12:16275
7627	NTIS MF A01; 2 (GPO Dep.)	E 1.99: DE87005493	MN -25	12:16276
HEDL-SA-				
3280-FP	NTIS, PC A02/MF A01; 1	DE87004091	MN -25	12:16277
3319-FP	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004085	MN -79	12:16278
3336-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005456	MN -79	12:15853
3363-FP	NTIS, PC A02; 3	DE87004087	MN -79	12:15983
3475-FP	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004346	MN -79b	12:15854
3484-FP	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004348	MN -79b	12:15855
3534-FP	NTIS, PC A02; 3	DE87005480	MN -79	12:15377
3589-FP	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004432	MN -79a	12:15984
HHS/PUB/FDA-				
86-8263	*See* PB-87-107892/XAB			12:16814
86-8266	*See* PB-87-113031/XAB			12:16861
HMI-B-				
429	NTIS (US Sales Only), PC A09/MF A01	DE87750520	MN -34C	12:17194
HSK-AN-				
1816	NTIS (US Sales Only), PC A05/MF A01	DE87700700	MN -41	12:16031
IA-				
151/ 86	*See* OEFZS-4376	DE87700848	MN -23	12:15580
IAE-				
0002	*See* CNIC-00002	DE87701272	MN -86	12:15381
0003	*See* CNIC-00003	DE87701273	MN -86	12:15382
0004	*See* CNIC-00004	DE87701274	MN -4	12:16382
0005	*See* CNIC-00005	DE87701275	MN -28	12:16537
0006	*See* CNIC-00006	DE87701276	MN -34C	12:17254
0007	*See* CNIC-00007	DE87701277	MN -32	12:17255
0008	*See* CNIC-00008	DE87701278	MN -4	12:16383
0009	*See* CNIC-00009	DE87701279	MN -28	12:16521
0010	*See* CNIC-00010	DE87701280	MN -37	12:16597
3999/ 4	NTIS (US Sales Only), PC A02/MF A01	DE87701283	MN -25	12:16331
4027/ 10	NTIS (US Sales Only), PC A02/MF A01	DE87700701	MN -34A	12:17355
4067/ 4	NTIS (US Sales Only), PC A03/MF A01	DE87700702	MN -80	12:15836
4072/ 3	NTIS (US Sales Only), PC A03/MF A01	DE87700703	MN -2	12:15870
4110/ 2	NTIS (US Sales Only), PC A02/MF A01	DE87700704	MN -46	12:17311
4118/ 3	NTIS (US Sales Only), PC A02/MF A01	DE87700705	MN -78	12:16032
4132/ 2	NTIS (US Sales Only), PC A03/MF A01	DE87700706	MN -34C	12:17225
IAEA-R-				
3178-F	NTIS (US Sales Only), PC A02/MF A01	DE87701284	MN -20	12:17433
IAEA-TC-				
579-24	NTIS (US Sales Only), PC A03; 3	DE87900499	MN -78	12:16033
579-31	NTIS (US Sales Only), PC A02; 3	DE87900500	MN -78	12:16034
579/ 42	NTIS (US Sales Only), PC A03; 3	DE87900503	MN -78	12:16035
IAEA-TECDOC-				
376	NTIS (US Sales Only), PC A06/MF A01	DE87700889	MN -2	12:15871
378	NTIS (US Sales Only), PC A15/MF A01	DE87700707	MN -2	12:15881
383	NTIS (US Sales Only), PC A04/MF A01	DE87701286	MN -2	12:15904
384	NTIS (US Sales Only), PC A08/MF A01	DE87700708	MN -80	12:15985
385	NTIS (US Sales Only), PC A07/MF A01	DE87701287	MN -2	12:17195
388	NTIS (US Sales Only), PC A14/MF A01	DE87700709	MN -20	12:17434
ICMA-				
86-101	*See* AD-A-173730/3/XAB			12:17639

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
IFSR-					
267	*See* DOE/ET/53088-267	E 1.99:	DE87004852	MN -20	12:17401
IFVE-OEF-					
85-32	NTIS (US Sales Only), PC A02/MF A01		DE87700710	MN -34D	12:17103
85-40	NTIS (US Sales Only), PC A02/MF A01		DE87700711	MN -37	12:16613
85-153	NTIS (US Sales Only), PC A03/MF A01		DE87701288	MN -37	12:16614
85-174	NTIS (US Sales Only), PC A02/MF A01		DE87700712	MN -37	12:16615
IFVE-OEF-ORI-					
85-36	NTIS (US Sales Only), PC A02/MF A01		DE87700713	MN -37	12:16616
IFVE-OEIPK-					
85-108	NTIS (US Sales Only), PC A02/MF A01		DE87700714	MN -34D	12:17104
IFVE-OI-					
85-134	NTIS (US Sales Only), PC A02/MF A01		DE87700715	MN -28	12:16552
85-185	NTIS (US Sales Only), PC A02/MF A01		DE87700716	MN -28	12:16524
IFVE-OKU-					
85-23	NTIS (US Sales Only), PC A02/MF A01		DE87700717	MN -28	12:16553
IFVE-ONF-					
85-73	NTIS (US Sales Only), PC A02/MF A01		DE87700718	MN -37	12:16617
85-107	NTIS (US Sales Only), PC A02/MF A01		DE87700719	MN -34D	12:17105
IFVE-ONF-OEF-					
85-157	NTIS (US Sales Only), PC A02/MF A01		DE87701289	MN -37	12:16618
IFVE-OP-					
85-132	NTIS (US Sales Only), PC A02/MF A01		DE87700720	MN -28	12:16554
85-149	NTIS (US Sales Only), PC A02/MF A01		DE87700721	MN -28	12:16555
IFVE-ORI-					
85-148	NTIS (US Sales Only), PC A02/MF A01		DE87700722	MN -28	12:16556
IFVE-OTF-					
85-9	NTIS (US Sales Only), PC A03/MF A01		DE87700723	MN -34D	12:17162
85-30	NTIS (US Sales Only), PC A02/MF A01		DE87700724	MN -34D	12:17130
85-56	NTIS (US Sales Only), PC A02/MF A01		DE87700725	MN -34D	12:17360
85-70	NTIS (US Sales Only), PC A02/MF A01		DE87700726	MN -34D	12:17361
85-71	NTIS (US Sales Only), PC A02/MF A01		DE87700727	MN -34D	12:17131
85-112	NTIS (US Sales Only), PC A02/MF A01		DE87700728	MN -34C	12:17262
85-117	NTIS (US Sales Only), PC A02/MF A01		DE87700729	MN -34D	12:17163
85-167	NTIS (US Sales Only), PC A02/MF A01		DE87700730	MN -34D	12:17362
IG-					
86/ 01	NTIS (US Sales Only), PC A03/MF A01		DE87700731	MN -11	12:16791
INDC(AUS)-					
011/ LI	NTIS (US Sales Only), PC A02/MF A01		DE87701290	MN -46	12:17312
INDC(NDS)-					
182/ GE	NTIS (US Sales Only), PC A04/MF A01		DE87700915	MN -34C	12:17196
INIS-mf-					
10252	NTIS (US Sales Only), PC A04/MF A01		DE87750516	MN -34D	12:17132
10282	NTIS (US Sales Only), PC A05/MF A01		DE87750523	MN -34C	12:17229
10312	NTIS (US Sales Only), PC A03/MF A01		DE87750498	MN -86	12:15388
10313	NTIS (US Sales Only), PC A09/MF A01		DE87750499	MN -80	12:16036
10317	NTIS (US Sales Only), PC A05/MF A01		DE87750512	MN -13	12:17635
10318	NTIS (US Sales Only), PC A08/MF A01		DE87750515	MN -34D	12:17133
10524	NTIS (US Sales Only), PC A03/MF A01		DE87701295	MN -41	12:16037
10528	NTIS (US Sales Only), PC A05/MF A01		DE87701296	MN -2	12:17636
10552	NTIS (US Sales Only), PC A03/MF A01		DE87700732	MN -23	12:16844
10553(Vol.1)	NTIS (US Sales Only), PC A07/MF A01		DE87700733	MN -2	12:17637
10553(Vol.2)	NTIS (US Sales Only), PC A06/MF A01		DE87700734	MN -2	12:17638
10554	NTIS (US Sales Only), PC A06/MF A01		DE87700735	MN -37	12:16619
10555	NTIS (US Sales Only), PC A11/MF A01		DE87700736	MN -51	12:16038
10556-Vol.1	NTIS (US Sales Only), PC A14/MF A01		DE87700737	MN -34B	12:16944
10556-Vol.2	NTIS (US Sales Only), PC A02/MF A01		DE87700738	MN -34D	12:17140
10558	NTIS (US Sales Only), PC A03/MF A01		DE87700739	MN -34C	12:17264
10559	NTIS (US Sales Only), PC A05/MF A01		DE87700740	MN -37	12:16628
10560	NTIS (US Sales Only), PC A13/MF A01		DE87700741	MN -79	12:15856
INIS-SU-					
370	NTIS (US Sales Only), PC A04/MF A01		DE87780078	MN -32	12:17189
INIS-XN-					
23	NTIS (US Sales Only), PC A02/MF A01		DE87701297	MN -2	12:17682
24	NTIS (US Sales Only), PC A02/MF A01		DE87701298	MN -2	12:17683
37	NTIS (US Sales Only), PC A02/MF A01		DE87701299	MN -2	12:15569
38	NTIS (US Sales Only), PC A02/MF A01		DE87701300	MN -2	12:15570
39	NTIS (US Sales Only), PC A03/MF A01		DE87701301	MN -2	12:15571
40	NTIS (US Sales Only), PC A02/MF A01		DE87701302	MN -2	12:17684
41	NTIS (US Sales Only), PC A02/MF A01		DE87701303	MN -2	12:15572
42	NTIS (US Sales Only), PC A02/MF A01		DE87701304	MN -2	12:15573
43	NTIS (US Sales Only), PC A02/MF A01		DE87701305	MN -2	12:17685
44	NTIS (US Sales Only), PC A03/MF A01		DE87701306	MN -2	12:16057
45	NTIS (US Sales Only), PC A02/MF A01		DE87701307	MN -2	12:16058
46	NTIS (US Sales Only), PC A02/MF A01		DE87701308	MN -2	12:15574
47	NTIS (US Sales Only), PC A09/MF A01		DE87701309	MN -2	12:15399
48	NTIS (US Sales Only), PC A02/MF A01		DE87701310	MN -2	12:15575
49	NTIS (US Sales Only), PC A02/MF A01		DE87701311	MN -2	12:15576
50	NTIS (US Sales Only), PC A02/MF A01		DE87701312	MN -2	12:16059
INPE-					
009-PRE/ 1001	NTIS, PC A02/MF A01				12:16359
INS-					
543	NTIS (US Sales Only), PC A02/MF A01		DE87701313	MN -34A	12:17347
550	NTIS (US Sales Only), PC A02/MF A01		DE87701314	MN -34C	12:17210

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
553	NTIS (US Sales Only), PC A02/MF A01	DE87701315	MN -34C	12:17285
INS-TEC-				
22	NTIS (US Sales Only), PC A06/MF A01	DE87701316	MN -34D	12:17112
INS-TH-				
161	NTIS (US Sales Only), PC A04/MF A01	DE87701317	MN -34D	12:17113
IPNO-DRE-				
85-16	NTIS (US Sales Only), PC A04/MF A01; 1	DE87750758	MN -28	12:16559
85-21	NTIS (US Sales Only), PC A03/MF A01; 1	DE87750732	MN -34A	12:17080
IPNO-TH-				
86-09	NTIS (US Sales Only), PC A03/MF A01	DE87750579	MN -34D	12:17142
IPP-				
2/ 280	NTIS (US Sales Only), PC A02/MF A01	DE87750502	MN -20f	12:17406
9/ 47	NTIS (US Sales Only), PC A03/MF A01	DE87750506	MN -20d	12:17435
III/ 112	NTIS (US Sales Only), PC A03/MF A01	DE87750504	MN -20f	12:17407
ISN-				
84-47	NTIS (US Sales Only), PC A03/MF A01	DE87750443	MN -34C	12:17286
ITEF-				
25(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700742	MN -34C	12:17197
76(1985)	NTIS (US Sales Only), PC A03/MF A01	DE87700743	MN -34D	12:17365
81(1985)	NTIS (US Sales Only), PC A04/MF A01	DE87701318	MN -34A	12:17348
101(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700744	MN -34D	12:17366
102(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700745	MN -34D	12:17367
109(1985)	NTIS (US Sales Only), PC A04/MF A01	DE87701319	MN -34D	12:17368
120(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700746	MN -34D	12:17369
121(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87701320	MN -34C	12:17198
130(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700747	MN -34D	12:17199
145(1985)	NTIS (US Sales Only), PC A04/MF A01	DE87700748	MN -20	12:17436
182(1984)	NTIS (US Sales Only), PC A02/MF A01	DE87701321	MN -34D	12:17164
186(1984)	NTIS (US Sales Only), PC A03/MF A01	DE87700749	MN -34A	12:17349
191(1984)	NTIS (US Sales Only), PC A02/MF A01	DE87700750	MN -34D	12:17215
ITEP-				
45(1985)	NTIS (US Sales Only), PC A04/MF A01	DE87700751	MN -34D	12:17165
115(1985)	NTIS (US Sales Only), PC A03/MF A01	DE87701322	MN -34D	12:17114
118(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700752	MN -34C	12:17238
149(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700753	MN -34D	12:17143
153(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700754	MN -34D	12:17144
154(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700755	MN -34C	12:17287
156(1985)	NTIS (US Sales Only), PC A02/MF A01	DE87700756	MN -34D	12:17166
187(1984)	NTIS (US Sales Only), PC A03/MF A01	DE87701323	MN -34D	12:17115
ITF-				
85-80-R	NTIS (US Sales Only), PC A02/MF A01	DE87701324	MN -20	12:17408
85-118-R	NTIS (US Sales Only), PC A02/MF A01	DE87701325	MN -34B	12:16957
85-134-R	NTIS (US Sales Only), PC A03/MF A01	DE87700757	MN -34D	12:17370
86-4-R	NTIS (US Sales Only), PC A02/MF A01	DE87700758	MN -34D	12:17167
86-18-R	NTIS (US Sales Only), PC A02/MF A01	DE87700759	MN -34D	12:17168
86-29-R	NTIS (US Sales Only), PC A02/MF A01	DE87700760	MN -34B	12:16958
86-31-R	NTIS (US Sales Only), PC A02/MF A01	DE87700761	MN -34D	12:17169
ITP-				
85-73-E	NTIS (US Sales Only), PC A02/MF A01	DE87701326	MN -20	12:17409
85-117-E	NTIS (US Sales Only), PC A02/MF A01	DE87700762	MN -34C	12:17288
86-20-E	NTIS (US Sales Only), PC A02/MF A01	DE87700763	MN -34D	12:17371
86-25-E	NTIS (US Sales Only), PC A02/MF A01	DE87700764	MN -34D	12:17372
IWS-				
134-14	*See* PB-87-108395/XAB			12:16713
JA-				
5830	*See* AD-A-174034/9/XAB			12:16462
JAERI-M-				
86-067	NTIS (US Sales Only), PC A06/MF A01	DE87701064	MN -34C	12:17200
JINR-				
6-84-819	NTIS (US Sales Only), PC A02/MF A01	DE87700765	MN -34C	12:17232
9-85-769	NTIS (US Sales Only), PC A02/MF A01	DE87700766	MN -28	12:16526
13-85-306	NTIS (US Sales Only), PC A02/MF A01	DE87701327	MN -28	12:16560
13-85-734	NTIS (US Sales Only), PC A02/MF A01	DE87700767	MN -37	12:16672
13-85-754	NTIS (US Sales Only), PC A02/MF A01	DE87700768	MN -37	12:16629
13-85-795	NTIS (US Sales Only), PC A02/MF A01	DE87700769	MN -80	12:15995
13-85-810	NTIS (US Sales Only), PC A02/MF A01	DE87700770	MN -37	12:16630
13-85-817	NTIS (US Sales Only), PC A02/MF A01	DE87700771	MN -37	12:16631
13-85-839	NTIS (US Sales Only), PC A02/MF A01	DE87700772	MN -80	12:15959
13-85-840	NTIS (US Sales Only), PC A02/MF A01	DE87700773	MN -80	12:15960
13-86-13	NTIS (US Sales Only), PC A02/MF A01	DE87700774	MN -37	12:16632
D-13-85-653	NTIS (US Sales Only), PC A02/MF A01	DE87701328	MN -37	12:16633
E-1-85-861	NTIS (US Sales Only), PC A02/MF A01	DE87700775	MN -34C	12:17211
E-2-85-737	NTIS (US Sales Only), PC A02/MF A01	DE87700776	MN -34D	12:17145
E-2-85-748	NTIS (US Sales Only), PC A02/MF A01	DE87700777	MN -34C	12:17289
E-2-85-779	NTIS (US Sales Only), PC A02/MF A01	DE87700778	MN -34D	12:17170
E-2-85-794	NTIS (US Sales Only), PC A02/MF A01	DE87700779	MN -34D	12:17159
E-2-85-808	NTIS (US Sales Only), PC A02/MF A01	DE87700780	MN -34D	12:17146
E-2-85-865	NTIS (US Sales Only), PC A02/MF A01	DE87700781	MN -34D	12:17171
E-2-85-930	NTIS (US Sales Only), PC A03/MF A01	DE87700782	MN -34D	12:17373
E-4-85-527	NTIS (US Sales Only), PC A02/MF A01	DE87700783	MN -34D	12:17374
E-4-85-706	NTIS (US Sales Only), PC A02/MF A01	DE87701329	MN -34C	12:17290
E-4-85-728	NTIS (US Sales Only), PC A02/MF A01	DE87701330	MN -34C	12:17291
E-4-86-40	NTIS (US Sales Only), PC A02/MF A01	DE87700784	MN -34D	12:17375
E-5-85-867	NTIS (US Sales Only), PC A02/MF A01	DE87700785	MN -34D	12:17376

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
E-7-85-431	NTIS (US Sales Only), PC A07/MF A01	DE87701331	MN -34C	12:17292
E-14-85-284	NTIS (US Sales Only), PC A02/MF A01	DE87701332	MN -25	12:16280
E-16-85-814	NTIS (US Sales Only), PC A02/MF A01	DE87700786	MN -37	12:16634
E-19-85-202	NTIS (US Sales Only), PC A02/MF A01	DE87700787	MN -48	12:16858
R-2-85-343	NTIS (US Sales Only), PC A02/MF A01	DE87701333	MN -34D	12:17147
R-2-85-729	NTIS (US Sales Only), PC A02/MF A01	DE87701334	MN -34D	12:17172
R-2-86-147	NTIS (US Sales Only), PC A02/MF A01	DE87701145	MN -34D	12:17148
R-4-85-239	NTIS (US Sales Only), PC A02/MF A01	DE87701335	MN -34D	12:17378
R-7-85-261	NTIS (US Sales Only), PC A02/MF A01	DE87701336	MN -25	12:16483
R-7-86-6	NTIS (US Sales Only), PC A02/MF A01	DE87701166	MN -34C	12:17293
R-10-85-333	NTIS (US Sales Only), PC A02/MF A01	DE87701337	MN -32	12:17649
R-11-85-344	NTIS (US Sales Only), PC A02/MF A01	DE87701338	MN -80	12:15961
R-13-85-256	NTIS (US Sales Only), PC A02/MF A01	DE87701339	MN -28	12:16561
R-13-85-819	NTIS (US Sales Only), PC A02/MF A01	DE87701340	MN -37	12:16635
JINR-R-				
1-85-220	NTIS (US Sales Only), PC A02/MF A01	DE87700788	MN -34D	12:17116
1-85-228	NTIS (US Sales Only), PC A02/MF A01	DE87700789	MN -34D	12:17149
1-85-820	NTIS (US Sales Only), PC A02/MF A01	DE87700790	MN -34C	12:17201
1-85-854	NTIS (US Sales Only), PC A02/MF A01	DE87700791	MN -34D	12:17117
1-85-948	NTIS (US Sales Only), PC A02/MF A01	DE87700792	MN -34D	12:17118
2-85-152	NTIS (US Sales Only), PC A02/MF A01	DE87700793	MN -34D	12:17150
2-85-420	NTIS (US Sales Only), PC A02/MF A01	DE87700794	MN -34D	12:17173
2-85-520	NTIS (US Sales Only), PC A02/MF A01	DE87700795	MN -34D	12:17174
2-85-712	NTIS (US Sales Only), PC A02/MF A01	DE87700796	MN -34D	12:17379
2-85-723	NTIS (US Sales Only), PC A02/MF A01	DE87700797	MN -34D	12:17175
2-85-767	NTIS (US Sales Only), PC A02/MF A01	DE87700798	MN -34D	12:17151
2-85-830	NTIS (US Sales Only), PC A02/MF A01	DE87700799	MN -34C	12:17294
2-85-831	NTIS (US Sales Only), PC A02/MF A01	DE87700800	MN -34D	12:17152
2-85-942	NTIS (US Sales Only), PC A02/MF A01	DE87700801	MN -34D	12:17176
4-85-816	NTIS (US Sales Only), PC A02/MF A01	DE87700802	MN -34D	12:17177
4-85-876	NTIS (US Sales Only), PC A02/MF A01	DE87700803	MN -34C	12:17295
4-86-115	NTIS (US Sales Only), PC A02/MF A01	DE87700804	MN -34C	12:17296
6-85-753	NTIS (US Sales Only), PC A02/MF A01	DE87700805	MN -37	12:16636
9-85-271	NTIS (US Sales Only), PC A02/MF A01	DE87700806	MN -34D	12:17178
10-85-744	NTIS (US Sales Only), PC A02/MF A01	DE87700807	MN -37	12:16637
10-85-781	NTIS (US Sales Only), PC A02/MF A01	DE87700808	MN -25	12:16484
10-85-783	NTIS (US Sales Only), PC A02/MF A01	DE87700809	MN -37	12:16638
11-85-757	NTIS (US Sales Only), PC A02/MF A01	DE87700810	MN -32	12:17650
11-85-764	NTIS (US Sales Only), PC A02/MF A01	DE87700811	MN -34D	12:17380
11-85-765	NTIS (US Sales Only), PC A02/MF A01	DE87700812	MN -34D	12:17381
11-85-766	NTIS (US Sales Only), PC A02/MF A01	DE87700813	MN -28	12:16527
13-85-752	NTIS (US Sales Only), PC A02/MF A01	DE87700814	MN -37	12:16639
15-85-786	NTIS (US Sales Only), PC A02/MF A01	DE87700815	MN -37	12:16640
16-85-802	NTIS (US Sales Only), PC A02/MF A01	DE87700816	MN -37	12:16641
JPL-PUB-				
85-85	*See* DOE/ER/13007-1	E 1.99: DE87004646	MN -34	12:17342
85-86	*See* DOE/JPL-1012-113	E 1.99: DE87005419	MN -63b	12:15603
85-96	*See* DOE/JPL-1012-115	E 1.99: DE87005420	MN -63b	12:17647
86-6	*See* DOE/JPL-1012-120	E 1.99: DE87005424	MN -63b	12:15604
86-7	*See* DOE/JPL-1012-121	E 1.99: DE87005425	MN -63b	12:15605
86-13	*See* DOE/JPL/1060-96	E 1.99: DE87005431	MN -62	12:15619
86-17	*See* DOE/JPL-1012-123	E 1.99: DE87005427	MN -63b	12:15606
86-42	*See* N-87-12048			12:15608
Juel-Conf-				
55	NTIS (US Sales Only), MF A01; 2	DE87751308	MN -4	12:16390
58	NTIS (US Sales Only), PC A12/MF A01; 1	DE87751309	MN -92	12:16159
Juel-Spez-				
352	NTIS (US Sales Only), PC A20/MF A01; 1	DE87751297	MN -98B	12:16170
KFK-				
3930-UF	NTIS (US Sales Only), PC A07/MF A01; 1	DE87750864	MN -4	12:16404
4019	NTIS (US Sales Only), PC A04/MF A01	DE87750525	MN -4	12:16391
4094	NTIS (US Sales Only), PC A05/MF A01	DE87750505	MN -38	12:16475
4099	NTIS (US Sales Only), PC A03/MF A01	DE87750521	MN -32	12:17651
4113	NTIS (US Sales Only), PC A06/MF A01	DE87750507	MN -20d	12:17437
4120	NTIS (US Sales Only), PC A02/MF A01	DE87750503	MN -20d	12:17438
4123	NTIS (US Sales Only), PC A04/MF A01	DE87750508	MN -11	12:16686
4124	NTIS (US Sales Only), PC A03/MF A01	DE87750511	MN -11	12:16687
4126	NTIS (US Sales Only), PC A03/MF A01	DE87750510	MN -11	12:16688
4134	NTIS (US Sales Only), PC A04/MF A01	DE87750517	MN -4	12:16430
4137	NTIS (US Sales Only), PC A08/MF A01; 1	DE87751303	MN -25	12:16281
KFKI-				
1986-23/ C	NTIS (US Sales Only), PC A02/MF A01	DE87700817	MN -34B	12:16960
1986-32/ B	NTIS (US Sales Only), PC A02/MF A01	DE87700818	MN -34B	12:16961
1986-37/ A	NTIS (US Sales Only), PC A02/MF A01	DE87700819	MN -34D	12:17382
1986-40/ G	NTIS (US Sales Only), PC A02/MF A01	DE87700820	MN -80	12:15802
1986-41/ C	NTIS (US Sales Only), PC A02/MF A01	DE87700821	MN -34B	12:16962
1986-47/ A	NTIS (US Sales Only), PC A02/MF A01	DE87700822	MN -34D	12:17383
1986-48/ A	NTIS (US Sales Only), PC A04/MF A01	DE87700823	MN -34D	12:17384
1986-51/ B	NTIS (US Sales Only), PC A02/MF A01	DE87700825	MN -34D	12:17385
KFTI-				
85-6	NTIS (US Sales Only), PC A02/MF A01	DE87700826	MN -20	12:17410
KIYI-				
85-6	NTIS (US Sales Only), PC A02/MF A01	DE87700827	MN -2	12:17652
85-13	NTIS (US Sales Only), PC A03/MF A01	DE87700828	MN -37	12:16642

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
85-17	NTIS (US Sales Only), PC A02/MF A01		DE87700829	MN -37	12:16490
85-19	NTIS (US Sales Only), PC A03/MF A01		DE87700830	MN -80	12:15962
85-21	NTIS (US Sales Only), PC A02/MF A01		DE87700831	MN -28	12:16510
85-22	NTIS (US Sales Only), PC A02/MF A01		DE87700832	MN -28	12:16511
85-23	NTIS (US Sales Only), PC A02/MF A01		DE87700833	MN -28	12:16512
85-25	NTIS (US Sales Only), PC A03/MF A01		DE87700834	MN -34C	12:17297
85-27	NTIS (US Sales Only), PC A03/MF A01		DE87700835	MN -37	12:16643
85-28	NTIS (US Sales Only), PC A03/MF A01		DE87700836	MN -37	12:16644
85-31	NTIS (US Sales Only), PC A02/MF A01		DE87700837	MN -34C	12:17226
85-32	NTIS (US Sales Only), PC A03/MF A01		DE87700838	MN -32	12:17653
85-35	NTIS (US Sales Only), PC A03/MF A01		DE87700839	MN -34C	12:17252
85-36	NTIS (US Sales Only), PC A03/MF A01		DE87700840	MN -37	12:16645
86-34	NTIS (US Sales Only), PC A02/MF A01		DE87700841	MN -28	12:16562
KURRI-TR-					
266	NTIS (US Sales Only), PC A04/MF A01		DE87701222	MN -37	12:16646
L-					
16036	*See* N-87-11963				12:16476
16136	*See* N-87-13022				12:16707
16196	*See* N-87-12680				12:16363
LA-					
10700-MS	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87004770	STD -10	12:16282
10742-MS	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87002234	STD -33A	12:15582
10811-MS	NTIS, PC A02/MF A01		DE87004767	STD -15	12:15564
10815-MS	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004769	STD -15	12:16647
10817-MS	*See* NUREG/CR-4737		TI87004848	MN -70B	12:15440
10859-MS	NTIS, PC A05/MF A01; 1		DE87004764	STD -70	12:16918
LA-UR-					
86-2243	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005133	MN -28	12:16513
86-3395	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87001954	MN -34B	12:16963
86-3643	NTIS, PC A02; 3		DE87005132	MN -28	12:16528
86-3705	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002929	MN -20d	12:17484
86-3745	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002927	MN -32	12:17350
86-3786	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002917	MN -32	12:17202
86-3861	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005131	MN -28	12:16563
86-3863	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005130	MN -28	12:16564
86-4113	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003720	MN -15	12:15565
86-4115	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003721	MN -34B	12:16964
86-4116	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003722	MN -34B	12:16965
86-4144	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003726	MN -34D	12:17160
86-4152	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87003727	MN -34D	12:17179
86-4153	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87003728	MN -34	12:17411
86-4187	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003734	MN -34	12:17351
86-4264	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003743	MN -34	12:17298
86-4285	NTIS, PC A02/MF A01		DE87003744	MN -38	12:16491
86-4286	NTIS, PC A02/MF A01; 1		DE87003745	MN -38	12:16492
86-4331	NTIS, PC A02; 3		DE87003752	MN -34B	12:16966
86-4339	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003755	MN -34A	12:17352
86-4347	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003757	MN -25	12:16283
86-4387	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003763	MN -37	12:16648
87-15	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005126	MN -25	12:16284
87-16	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87005125	MN -25	12:16285
87-22	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005124	MN -34	12:17386
87-38	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE87005123	MN -34B	12:16967
87-78	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004500	MN -45	12:16678
87-83	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005113	MN -34	12:16466
LAL-RT-					
85-16	NTIS (US Sales Only), PC A02/MF A01		DE87750450	MN -28	12:16529
LAPP-TH-					
147	NTIS (US Sales Only), PC A02/MF A01		DE87750585	MN -34D	12:17153
152	NTIS (US Sales Only), PC A02/MF A01		DE87750580	MN -34D	12:17154
LBL-					
21293	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003524	MN -28	12:16565
21862	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003550	MN -11	12:16203
22261	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87002544	MN -25	12:15760
22277	NTIS, PC A02; 3		DE87002562	MN -34D	12:17180
22282	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003539	MN -34A	12:17081
22418	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004600	MN -34A	12:17082
22445	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004476	MN -28	12:16566
22450	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003532	MN -28	12:16567
22559	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004477	MN -70	12:16919
22560	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004475	MN -34C	12:17207
LRP-					
306/ 86	NTIS (US Sales Only), PC A02/MF A01		DE87900430	MN -20	12:17412
LYCEN-					
8445	NTIS (US Sales Only), PC A02/MF A01		DE87750581	MN -25	12:16286
MMS-					
86-0127-Vol.1	Minerals Management Service, 18th and C Streets, NW, Washington, DC 20240		TI87900476	MN -92a	12:15363
MS-					
7019	*See* AD-A-174015/8/XAB				12:16486
N-					
87-11717	NTIS, PC A22/MF A01				12:16437
87-11790	NTIS, PC A02/MF A01				12:16228
87-11837	NTIS, PC A04/MF A01				12:16187

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
87-11838	NTIS, PC A02/MF A01			12:15624
87-11857	NTIS, PC A02/MF A01			12:16705
87-11858	NTIS, PC A06/MF A01			12:16499
87-11873	NTIS, PC A03/MF A01			12:16287
87-11875	NTIS, PC A02/MF A01			12:16288
87-11889	NTIS, PC A03/MF A01			12:16289
87-11892	NTIS, PC A10/MF A01			12:16332
87-11893	NTIS, PC A02/MF A01			12:16360
87-11960	NTIS, PC A02/MF A01			12:16433
87-11963	NTIS, PC A03/MF A01			12:16476
87-11965	NTIS, PC A02/MF A01			12:16443
87-12018	NTIS, PC A03/MF A01			12:16444
87-12048	NTIS, PC A03/MF A01			12:15608
87-12059	NTIS, PC A02/MF A01			12:16706
87-12356	NTIS, PC A03/MF A01			12:16361
87-12357	NTIS, PC A02/MF A01			12:16290
87-12406	NTIS, PC A02/MF A01			12:16968
87-12407	NTIS, PC A10/MF A01			12:16969
87-12508	NTIS, PC A03/MF A01			12:17029
87-12510	NTIS, PC A02/MF A01			12:17030
87-12519	NTIS, PC A03/MF A01			12:17031
87-12520	NTIS, PC A07/MF A01			12:17032
87-12522	NTIS, PC A08/MF A01			12:17033
87-12523	NTIS, PC A03/MF A01			12:17034
87-12679	NTIS, PC A02/MF A01			12:16362
87-12680	NTIS, PC A02/MF A01			12:16363
87-12910	NTIS, PC A02/MF A01			12:16333
87-13022	NTIS, PC A04/MF A01			12:16707
87-13307	NTIS, PC A03/MF A01			12:17413
87-13362	NTIS, PC A04/MF A01			12:16673
87-13363	NTIS, PC A03/MF A01			12:17035
87-13365	NTIS, PC A02/MF A01			12:17036
87-13366	NTIS, PC A02/MF A01			12:17037
87-13367	NTIS, PC A02/MF A01			12:17038
87-13368	NTIS, PC A05/MF A01			12:17039
87-13375	NTIS, PC A02/MF A01			12:17054
87-13379	NTIS, PC A04/MF A01			12:17040
87-13394	NTIS, PC A04/MF A01			12:17041
87-13395	NTIS, PC A02/MF A01			12:17042
NAS-				
1.15:87669	*See* N-87-12018			12:16444
1.15:88232	*See* N-87-11965			12:16443
1.15:88259	*See* N-87-13363			12:17035
1.15:88505	*See* N-87-13375			12:17054
1.15:88863	*See* N-87-11893			12:16360
1.15:88870	*See* N-87-12910			12:16333
1.15:88874	*See* N-87-11838			12:15624
1.15:88887	*See* N-87-11875			12:16288
1.15:88899	*See* N-87-12679			12:16362
1.15:89189	*See* N-87-12407			12:16969
1.15:89230	*See* N-87-12508			12:17029
1.15:89264	*See* N-87-13395			12:17042
1.15:89265	*See* N-87-13367			12:17038
1.15:89269	*See* N-87-13366			12:17037
1.15:89271	*See* N-87-13379			12:17040
1.26:88879	*See* N-87-11790			12:16228
1.26:176888	*See* N-87-12519			12:17031
1.26:177041	*See* N-87-13362			12:16673
1.26:177046	*See* N-87-12357			12:16290
1.26:177184	*See* N-87-12510			12:17030
1.26:177187	*See* N-87-12522			12:17033
1.26:177877	*See* N-87-13394			12:17041
1.26:178184	*See* N-87-11837			12:16187
1.26:178874	*See* N-87-11889			12:16289
1.26:178965	*See* N-87-13307			12:17413
1.26:179508	*See* N-87-11892			12:16332
1.26:179529	*See* N-87-11873			12:16287
1.26:179547	*See* N-87-11858			12:16499
1.26:179772	*See* N-87-12406			12:16968
1.26:179825	*See* N-87-11857			12:16705
1.26:179829	*See* N-87-11960			12:16433
1.26:179856	*See* N-87-12520			12:17032
1.26:179882	*See* N-87-12059			12:16706
1.26:179884	*See* N-87-12356			12:16361
1.26:179899	*See* N-87-12523			12:17034
1.26:179916	*See* N-87-12048			12:15608
1.26:179922	*See* N-87-13365			12:17036
1.26:179925	*See* N-87-13368			12:17039
1.55:2327-PT-1	*See* N-87-11717			12:16437
1.60:2583	*See* N-87-11963			12:16476
1.60:2625	*See* N-87-13022			12:16707
1.60:2639	*See* N-87-12680			12:16363
NASA-CP-				
2327-PT-1	*See* N-87-11717			12:16437

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
NASA-CR-				
176888	*See* N-87-12519			12:17031
177041	*See* N-87-13362			12:16673
177046	*See* N-87-12357			12:16290
177184	*See* N-87-12510			12:17030
177187	*See* N-87-12522			12:17033
177877	*See* N-87-13394			12:17041
178184	*See* N-87-11837			12:16187
178874	*See* N-87-11889			12:16289
178965	*See* N-87-13307			12:17413
179508	*See* N-87-11892			12:16332
179529	*See* N-87-11873			12:16287
179547	*See* N-87-11858			12:16499
179772	*See* N-87-12406			12:16968
179825	*See* N-87-11857			12:16705
179829	*See* N-87-11960			12:16433
179856	*See* N-87-12520			12:17032
179882	*See* N-87-12059			12:16706
179884	*See* N-87-12356			12:16361
179899	*See* N-87-12523			12:17034
179916	*See* N-87-12048			12:15608
179922	*See* N-87-13365			12:17036
179925	*See* N-87-13368			12:17039
NASA-TM-				
87669	*See* N-87-12018			12:16444
88232	*See* N-87-11965			12:16443
88259	*See* N-87-13363			12:17035
88505	*See* N-87-13375			12:17054
88863	*See* N-87-11893			12:16360
88870	*See* N-87-12910			12:16333
88874	*See* N-87-11838			12:15624
88879	*See* N-87-11790			12:16228
88887	*See* N-87-11875			12:16288
88899	*See* N-87-12679			12:16362
89189	*See* N-87-12407			12:16969
89230	*See* N-87-12508			12:17029
89264	*See* N-87-13395			12:17042
89265	*See* N-87-13367			12:17038
89269	*See* N-87-13366			12:17037
89271	*See* N-87-13379			12:17040
NASA-TP-				
2583	*See* N-87-11963			12:16476
2625	*See* N-87-13022			12:16707
2639	*See* N-87-12680			12:16363
NBI-HE-				
84-39	NTIS (US Sales Only), PC A02/MF A01	DE87750533	MN -34D	12:17181
84-42	NTIS (US Sales Only), PC A02/MF A01	DE87750534	MN -34D	12:17119
ND-R-				
1224(R)	UKAEA (Northern Division), Risley, Warrington WA3 6AT	TI87900473	ND -79h	12:16291
NDP-				
001	California Univ., San Diego, La Jolla (USA)			12:16708
002	Oak Ridge National Lab., TN (USA)			12:16689
003	East Anglia Univ. (UK). Climatic Research Unit			12:16690
004	Nuklear-Chemie und -Metallurgie G.m.b.H. (NUKEM), Hanau (Germany, F.R.)			12:16709
008	National Oceanic and Atmospheric Administration, Silver Spring, MD (USA)			12:16691
011	Brown Univ., Providence, RI (USA)			12:16692
012	Massachusetts Univ., Amherst (USA)			12:16693
014	National Oceanic and Atmospheric Administration, Boulder, CO (USA)			12:16694
016	National Oceanic and Atmospheric Administration, Asheville, NC (USA)			12:16695
017	Oak Ridge National Lab., TN (USA)			12:16710
NIIAR-				
19(665)	NTIS (US Sales Only), PC A02/MF A01	DE87701341	MN -25	12:16292
NIIEFA-P-D-				
0637	NTIS (US Sales Only), PC A03/MF A01	DE87700842	MN -28	12:16514
NIIEFA-P-E-				
0665	NTIS (US Sales Only), PC A02/MF A01	DE87700843	MN -28	12:16530
0671	NTIS (US Sales Only), PC A02/MF A01	DE87700844	MN -28	12:16568
NIIEFA-P-K-				
0681	NTIS (US Sales Only), PC A03/MF A01	DE87700845	MN -20	12:17414
0687	NTIS (US Sales Only), PC A02/MF A01	DE87700846	MN -20	12:17485
NIIEFA-P-V-				
0684	NTIS (US Sales Only), PC A02/MF A01	DE87700847	MN -28	12:16515
NIOSH-TR-HHE-				
80-022-OC	*See* PB-87-117602/XAB			12:16726
NMAB-				
430	*See* PB-87-120531/XAB			12:15737

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
NMRDI-				
2-74-4122	New Mexico Research and Development Institute, Suite M, 457 Washington S.E., Albuquerque, NM 87108; 1	DE87900515	MN -90	12:15305
NORDITA-				
84/ 43-Prepr.	NTIS (US Sales Only), PC A03/MF A01	DE87750526	MN -34B	12:17043
84/ 44-Prepr.	NTIS (US Sales Only), PC A02/MF A01	DE87750527	MN -34B	12:17044
85/ 12-Prepr.	NTIS (US Sales Only), PC A02/MF A01	DE87750528	MN -34B	12:17045
85/ 15-Prepr.	NTIS (US Sales Only), PC A02/MF A01	DE87750531	MN -34B	12:17046
85/ 16-Prepr.	NTIS (US Sales Only), PC A02/MF A01	DE87750530	MN -34D	12:17387
85/ 17-Prepr.	Nordisk Inst. for Teoretisk Atomfysik, Copenhagen, Denmark		ND -34B	12:17047
85/ 18-Prepr.	NTIS (US Sales Only), PC A03/MF A01	DE87750532	MN -34B	12:17048
85/ 19-Prepr.	NTIS (US Sales Only), PC A04/MF A01	DE87750529	MN -34B	12:17049
NP-				
7750863	NTIS (US Sales Only), PC A02/MF A01; 1	DE87750863	MN -97	12:16175
7750865	NTIS (US Sales Only), PC A05/MF A01; 1	DE87750865	MN -11	12:16774
7750866	NTIS (US Sales Only), PC A03/MF A01; 1	DE87750866	MN -98	12:16153
7751262	NTIS (US Sales Only), PC A05/MF A01	DE87751262	MN -90e	12:15329
7751299	NTIS (US Sales Only), MF A01; 2	DE87751299	MN -95d	12:16166
7751302	NTIS (US Sales Only), PC A04/MF A01; 1	DE87751302	MN -11	12:16775
7751304	NTIS (US Sales Only), PC A11/MF A01; 1	DE87751304	MN -11	12:16903
7770046	NTIS (US Sales Only), PC A15/MF A01; 1	DE87770046	MN -11	12:16157
7770047	NTIS (US Sales Only), PC A10/MF A01; 1	DE87770047	MN -91	12:15372
7770048	NTIS (US Sales Only), PC A08/MF A01; 1	DE87770048	MN -95f	12:16500
7770049	NTIS (US Sales Only), PC A08/MF A01; 1	DE87770049	MN -90d	12:15289
7770050	NTIS (US Sales Only), PC A06/MF A01; 1	DE87770050	MN -4	12:16405
7770051	NTIS (US Sales Only), PC A09/MF A01; 1	DE87770051	MN -96	12:16147
7770052	NTIS (US Sales Only), PC A07/MF A01; 1	DE87770052	MN -95d	12:16204
7770053	NTIS (US Sales Only), PC A07/MF A01; 1	DE87770053	MN -66d	12:15629
7770054	NTIS (US Sales Only), PC A08/MF A01; 1	DE87770054	MN -61E	12:15590
7770059	NTIS (US Sales Only), PC A10/MF A01; 1	DE87770059	MN -97	12:16477
7770060	NTIS (US Sales Only), MF A01; 2	DE87770060	MN -11	12:16904
7770061	NTIS (US Sales Only), MF A01; 2	DE87770061	MN -11	12:16235
7770062	NTIS (US Sales Only), PC A06/MF A01; 1	DE87770062	MN -90a	12:15268
7770063	NTIS (US Sales Only), PC A09/MF A01; 1	DE87770063	MN -11	12:16711
7900481	SOMED, Box 6282, Univ. of Alabama, Tuscaloosa, AL 35487	TI87900481	MN -90a	12:15306
7900486	School of Mines and Energy Development, Box 6282, University of Alabama, Tuscaloosa, AL 35486	TI87900486	MN -92a	12:15356
NTB-				
85-01	Nagra, Ch-5401 Baden, Switzerland		ND -70	12:15430
85-12	Nagra, Ch-5401 Baden, Switzerland		ND -70	12:15431
85-22	Nagra, Ch-5401 Baden, Switzerland		ND -4	12:16406
85-24	Nagra, Ch-5401 Baden, Switzerland		ND -70	12:15432
85-25	Nagra, Ch-5401 Baden, Switzerland		ND -70	12:15433
85-29	Nagra, Ch-5401 Baden, Switzerland		ND -70	12:15434
NUB-				
2663	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87002875	MN -34D	12:17182
NUREG-				
1137-Suppl.5	NTIS, PC A06/MF A01 - GPO	TI87900484	MN -78	12:16060
1199	NTIS, PC A06/MF A01 - GPO	TI87900510	MN -70B	12:15435
1200	NTIS, PC A20/MF A01 - GPO	TI87900511	MN -70B	12:15436
1237	NTIS, PC A20/MF A01 - GPO	TI87900482	MN -78	12:15803
1240	NTIS (US Sales Only), PC A20/MF A01 - GPO	TI87900474	MN -78	12:15804
NUREG/CR-				
4300-Vol.3-No.2	NTIS, PC A02/MF A01 - GPO	TI87005635	MN -78	12:15773
4320	NTIS, PC A04/MF A01 - GPO	TI87005236	MN -78	12:16061
4730	NTIS MF A01- GPO	TI87005636	MN -70B	12:15439
4737	NTIS, PC A11/MF A01 - GPO	TI87004848	MN -70B	12:15440
4788	NTIS, PC A12/MF A01 - GPO	TI87900512	MN -78	12:15805
OEFZS-				
4376	NTIS (US Sales Only), PC A03/MF A01	DE87700848	MN -23	12:15580
ORAU/IEA-				
86-2(M)	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87004874	MN -96	12:16209
ORNL-				
5947	NTIS, PC A09/MF A01; 1	DE83015056	STD -13	12:16154
6338	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87005223	MN -48	12:16859
6359	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87005292	MN -59B	12:15622
ORNL/CSD/TM-				
240	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005286	MN -70	12:17654
ORNL/ESH-				
1/ V24	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87005283	MN -11	12:16782
ORNL/FEDC-				
85/ 10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005278	STD -20c	12:17486
ORNL/M-				
294	NTIS, PC A02; 3	DE87005232	MN -25	12:16293
295	NTIS, PC A02; 3	DE87005231	MN -34A	12:17353
ORNL/PPA-				
87/ 1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005282	MN -2	12:16160
ORNL/Sub-				
81-69611/ 02	NTIS, PC A13/MF A01; 1 (GPO Dep.)	E 1.99: DE87005161	STD -90c	12:15290
85-28611/ 1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87005727	STD -97a	12:15668

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
ORNL/TM-				
9475	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87005270	STD -20f	12:17415
9998	NTIS, PC A04/MF A01	DE87004036	MN -4	12:16407
10038	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005285	MN -32	12:17655
10198	NTIS, PC A06/MF A01; 1	DE87005276	MN -92	12:15362
10226	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005271	MN -70	12:15441
10256	NTIS, PC A03/MF A01	DE87005269	STD -86	12:15389
10264/ V1	NTIS, PC A05/MF A01; 1	DE87005291	MN -95d	12:16205
10267	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005272	STD -25	12:15867
10294	NTIS, PC A03/MF A01; 1	DE87005288	MN -48	12:16813
10324	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005294	MN -22	12:16408
PATENTS-US-	(US: Commissioner of Patents, Washington, D.C. 20231, USA, $1.00 per copy. Government Patent Applications available from NTIS)			
4,623,409				12:16418
4,632,776				12:16416
4,633,082				12:16422
4,633,084				12:16396
4,633,523				12:16495
4,633,590				12:16675
4,634,567				12:17491
4,634,641				12:15615
4,634,856				12:16677
4,634,986				12:16494
4,635,111				12:16676
PB-				
86-210598/ XAB	NTISMF A01			12:16712
87-103636/ XAB	NTIS, PC A05/MF A01			12:15596
87-107595/ XAB	NTIS, PC A05/MF A01			12:17050
87-107603/ XAB	NTIS, PC A04/MF A01			12:17051
87-107892/ XAB	NTIS, PC A03/MF A01			12:16814
87-108395/ XAB	NTIS, PC A02/MF A01			12:16713
87-108759/ XAB	NTIS PC PC E07/MF E01			12:16206
87-109153/ XAB	NTIS PC PC E08/MF E01			12:15609
87-109161/ XAB	NTIS PC PC E04/MF E01			12:15623
87-109179/ XAB	NTIS PC PC E04/MF E01			12:16227
87-109591/ XAB	NTIS, PC A03/MF A01			12:16714
87-109773/ XAB	NTIS, PC A05/MF A01			12:16860
87-109872/ XAB	NTIS, PC A05/MF A01)			12:17331
87-110482/ XAB	NTIS, PC A06/MF A01			12:16715
87-110532/ XAB	NTIS PC PC E99			12:15591
87-110540/ XAB	NTIS, PC A03/MF A01			12:15592
87-110557/ XAB	NTIS, PC A08/MF A01			12:15593
87-110565/ XAB	NTIS, PC A10/MF A01			12:15594
87-110961/ XAB	NTIS, PC A05/MF A01			12:16716
87-111134/ XAB	NTIS, PC A04/MF A01			12:16717
87-111142/ XAB	NTIS, PC A03/MF A01			12:16718
87-111332/ XAB	NTIS, PC A04/MF A01			12:16719
87-111720/ XAB	NTIS, PC A09/MF A01			12:16720
87-111738/ XAB	NTIS, PC A08/MF A01			12:16221
87-111746/ XAB	NTIS, PC A12/MF A01			12:16222
87-112074/ XAB	NTIS, PC A99/MF A01			12:16210
87-112082/ XAB	NTIS, PC A16/MF A01			12:16211
87-112090/ XAB	NTIS, PC A03/MF A01			12:16212
87-112108/ XAB	NTIS, PC A17/MF A01			12:16213
87-112116/ XAB	NTIS, PC A15/MF A01			12:16214
87-112330/ XAB	NTIS, PC A02/MF A01			12:16721
87-112413/ XAB	NTIS, PC A05/MF A01			12:16776
87-112439/ XAB	NTIS, PC A06/MF A01			12:16783
87-112512/ XAB	NTIS PC PC E99			12:16229
87-112520/ XAB	NTIS, PC A05/MF A01			12:16230
87-112538/ XAB	NTIS, PC A15/MF A01			12:16231
87-112546/ XAB	NTIS, PC A11/MF A01			12:16232
87-113031/ XAB	NTIS, PC A04/MF A01			12:16861
87-113171/ XAB	NTIS, PC A03/MF A01			12:15322
87-113197/ XAB	NTIS, PC A06/MF A01			12:15325
87-113221/ XAB	NTIS, PC A03/MF A01			12:16722
87-113239/ XAB	NTIS PC PC E99			12:15314
87-113247/ XAB	NTIS, PC A17/MF A01			12:15315
87-113254/ XAB	NTIS, PC A07/MF A01			12:15316
87-113262/ XAB	NTIS, PC A12/MF A01			12:15317
87-113338/ XAB	NTIS PC PC E04/MF E04			12:16233
87-113783/ XAB	NTIS, PC A07/MF A01			12:16723
87-113882/ XAB	NTIS, PC A05/MF A01			12:16771
87-113973/ XAB	NTIS, PC A05/MF A01			12:16724
87-114252/ XAB	NTIS, PC A05/MF A01			12:17052
87-114260/ XAB	NTIS, PC A07/MF A01			12:17053
87-117156/ XAB	NTIS, PC A03/MF A01			12:16725
87-117602/ XAB	NTIS, PC A03/MF A01			12:16726
87-118634/ XAB	NTIS, PC A04/MF A01			12:16727
87-120531/ XAB	NTIS, PC A06/MF A01			12:15737
87-122156/ XAB	NTIS, PC A03/MF A01			12:16728
87-920999/ XAB	NTIS, PC A99			12:16911

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
PNL-					
5511-Vol.3-No.2	*See* NUREG/CR-4300-Vol.3-No.2		TI87005635	MN -78	12:15773
5929	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87003354	MN -70	12:15445
6087	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005564	MN -70	12:16920
6141	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005238	MN -61D	12:15610
PNL-SA-					
13772	NTIS, PC A02; 3		DE87004918	MN -70	12:15446
14017	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004129	MN -32	12:17656
14033	NTIS, PC A03; 3		DE87004919	MN -25	12:16294
14054	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87004923	MN -70	12:15447
14167	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002870	MN -90d	12:15295
14209	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004465	MN -41	12:16878
14407	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002709	MN -13	12:17631
PTB-Dos-					
14	NTIS (US Sales Only), PC A15/MF A01		DE87750519	MN -41	12:16649
PUB-					
154	*See* PB-87-112439/XAB				12:16783
R-					
83-915540-27	*See* N-87-11858				12:16499
RCM-					
02286	NTIS (US Sales Only), PC A11/MF A01		DE87750522	MN -4	12:16431
REPT-					
681104	*See* N-87-11837				12:16187
RFP-					
4060	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005044	MN -25	12:16295
RISO-M-					
2594	NTIS (US Sales Only), PC A05/MF A01		DE87750857	MN -20	12:17416
SAND-					
85-1449	*See* NUREG/CR-4320		TI87005236	MN -78	12:16061
85-7018/ 1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE87005178	MN -63	12:15616
86-0272C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87002052	MN -63	12:15617
86-1382C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004521	MN -21	12:17487
86-1865	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005623	MN -92	12:15367
86-1907C	NTIS, PC A03/MF A01; 1		DE87002494	MN -38	12:16445
86-2121C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005060	MN -34	12:16467
86-2126C	NTIS, PC A02/MF A01; 1		DE87003789	MN -25	12:16334
86-2181C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87003511	MN -63	12:15611
86-2414C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87005059	MN -25	12:15448
86-2474C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87001733	MN -71	12:16446
86-2553C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004517	MN -45	12:16679
86-2759	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005624	MN -25	12:16236
86-2814C	NTIS, PC A02/MF A01; 1		DE87003155	MN -25	12:16296
86-2856C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87003788	MN -25	12:16297
86-2909C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005066	MN -78	12:16062
86-7051	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99:	DE87005619	MN -63	12:15612
86-7161	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005212	MN -70	12:15449
86-7172	NTIS, PC A05/MF A01; 1		DE87005214	MN -70	12:15450
86-8187	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005582	MN -62a	12:15620
87-0073C	NTIS, PC A02; 3		DE87005068	MN -66a	12:15630
87-7001C	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005064	MN -70	12:16921
SASR-					
4	*See* N-87-13362				12:16673
SECV-SO-					
86-102	NTIS				12:15307
SERI/SP-					
232-3079	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE87005578	STD -61C	12:15613
SERI/STR-					
211-3053	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE87001133	STD -63	12:15614
SERI/TR-					
215-2948	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE87001134	MN -63	12:15597
SGD-					
504-PT-1	*See* PB-87-107595/XAB				12:17050
504-PT-2	*See* PB-87-107603/XAB				12:17051
SLAC-PUB-					
4144	NTIS, PC A02/MF A01; 1		DE87004559	MN -34D	12:17155
4179	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE87004898	MN -28	12:16516
4203	NTIS, PC A02; 3		DE87005596	MN -34D	12:17325
SPhT-					
86-023	*See* CEA-CONF-8340		DE87750575	MN -34A	12:17059
TNO-HMT-R-					
83/ 159A	NTIS (US Sales Only), PC A04/MF A01; 1		DE87751294	MN -90i	12:15319
TPR-NS-					
28-No.1	GPO		TI87000271	MN -41	12:16063
TR-					
192	*See* DOE/MC/12841-2254	E 1.99:	DE87005021	MN -93A	12:16193
TRI-PP-					
86-86	NTIS (US Sales Only), PC A02/MF A01; 1		DE87900303	MN -28	12:16569
86-100	NTIS (US Sales Only), PC A02/MF A01; 3		DE87900322	MN -34C	12:17299
86-104	NTIS (US Sales Only), PC A02; 3		DE87900324	MN -34D	12:17120
UBUFFALO/DC-					
86/ TR-14	*See* AD-A-173630/5/XAB				12:16345
UCB-PTH-					
86/ 30	*See* LBL-22277		DE87002562	MN -34D	12:17180

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
UCID-				
17530-87-Rev.6	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005268	MN -32	12:17417
20664-86	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE87005198	STD -32	12:17657
20946	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005200	MN -32	12:17658
UCRL-				
52000-86-11	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005196	STD -20	12:17488
53273-Rev.1	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE87005924	STD -91	12:15373
53726	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005588	STD -70	12:15451
53753	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE87005589	STD -25	12:16298
53757	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87005579	STD -41	12:16915
53774	NTIS, PC A02/MF A01; 1	DE87005197	STD -38	12:16478
94386	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004113	MN -25	12:16299
94402	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87003160	MN -37	12:16493
94676	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87003239	MN -41	12:16916
95026-Rev.2	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE87002552	MN -35	12:16683
95082	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87004355	MN -41	12:16879
95155-Rev.1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87004353	MN -13	12:16685
95532	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87003884	MN -13	12:17632
95588	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE87002755	MN -20a	12:17489
95652	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87003520	MN -32	12:17659
95825	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87003815	MN -2	12:16684
95853	NTIS, PC A02; 3	DE87004360	MN -34A	12:17083
95946	NTIS, PC A02; 3	DE87005053	MN -34C	12:17326
UCSD-				
10P10-240	*See* NUB-2663	E 1.99: DE87002875	MN -34D	12:17182
USAAVSCOM-TR-				
86-C-37	*See* N-87-11790			12:16228
UTNL-R-				
0176	NTIS (US Sales Only), PC A03/MF A01	DE87701240	MN -20	12:17490
UTRCN-S-				
8	NTIS (US Sales Only), PC A05/MF A01	DE87701241	MN -70	12:15452
VW-FMT-				
8409V/ 5	NTIS (US Sales Only), PC A02/MF A01; 1	DE87751301	MN -41	12:16905
WAPD-T-				
2873	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE87000912	MN -32	12:16395
WAPD-TM-				
1548	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE87005621	STD -25	12:15857
1616	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE87005625	STD -78	12:16674
WCCP-R-				
86-01	*See* AD-A-174003/4/XAB			12:16681

FILE NUMBER CORRELATION

This correlation list is provided for those organizations where document storage is alphanumeric by report number and request may be received by file number. For other information about a document (abstract number, distribution category, availability, and price), please refer to the Report Number Index.

File No.	*Report No.*
DE83015056	ORNL—5947
DE86000294	DOE/BC—86/1
DE86004249	DOE/MC/19281—T1
DE86007605	DOE/MC/21004—T3
DE86010427	DOE/MC/21004—T4
DE86011514	DOE/MC/20230—T5
DE86013230	DOE/MC/21004—T5
DE86015078	BNL—38491
DE87000439	EGG-M—18286
DE87000912	WAPD-T—2873
DE87001002	DOE/METC—87/6073
DE87001035	DOE/MC/20050—2226
DE87001133	SERI/STR—211-3053
DE87001134	SERI/TR—215-2948
DE87001557	CONF-8606241—5
DE87001558	CONF-8506333—1
DE87001561	ANL-HEP-CP—86-107
DE87001570	CONF-860501—17
DE87001733	SAND—86-2474C
DE87001941	CONF-861247—1
DE87001954	LA-UR—86-3395
DE87002052	SAND—86-0272C
DE87002100	EGG-M—19086
DE87002234	LA—10742-MS
DE87002264	DOE/FE/60177—2224
DE87002412	CONF-8608141—1
DE87002422	CONF-870203—1
DE87002494	SAND—86-1907C
DE87002544	LBL—22261
DE87002552	UCRL—95026-Rev.2
DE87002562	LBL—22277
DE87002709	PNL-SA—14407
DE87002755	UCRL—95588
DE87002811	CONF-861114—28
DE87002863	EGG—10282-1122
DE87002870	PNL-SA—14167
DE87002875	NUB—2663
DE87002878	CONF-850484—
DE87002917	LA-UR—86-3786
DE87002927	LA-UR—86-3745
DE87002929	LA-UR—86-3705
DE87003001	CONF-860148—10
DE87003005	CONF-870301—6
DE87003132	DOE/ER/40124—10
DE87003155	SAND—86-2814C
DE87003160	UCRL—94402
DE87003197	BNL—38848
DE87003203	BNL—38870
DE87003239	UCRL—94676
DE87003354	PNL—5929
DE87003375	CONF-8607112—1
DE87003413	DOE/ER/10694—1-Final
DE87003511	SAND—86-2181C
DE87003520	UCRL—95652
DE87003524	LBL—21293
DE87003532	LBL—22450
DE87003539	LBL—22282
DE87003550	LBL—21862
DE87003666	CONF-8508107—3
DE87003720	LA-UR—86-4113
DE87003721	LA-UR—86-4115
DE87003722	LA-UR—86-4116
DE87003726	LA-UR—86-4144
DE87003727	LA-UR—86-4152
DE87003728	LA-UR—86-4153
DE87003734	LA-UR—86-4187
DE87003743	LA-UR—86-4264
DE87003744	LA-UR—86-4285
DE87003745	LA-UR—86-4286
DE87003752	LA-UR—86-4331
DE87003755	LA-UR—86-4339
DE87003757	LA-UR—86-4347
DE87003763	LA-UR—86-4387
DE87003788	SAND—86-2856C
DE87003789	SAND—86-2126C
DE87003815	UCRL—95825
DE87003822	DOE/ER/45107—2
DE87003854	FNAL/C—86/156
DE87003884	UCRL—95532
DE87003893	DOE/DP/93032—T1
DE87003910	DOE/ER/13357—5
DE87003912	CONF-8509370—1
DE87003927	DOE/MC/22059—2268
DE87003929	DOE/ER/03244—134
DE87003951	CONF-850522—3
DE87003952	CONF-8608150—1
DE87003955	CONF-860948—5
DE87003994	DOE/ER/13247—3
DE87004018	CONF-860405—7
DE87004036	ORNL/TM—9998
DE87004062	CONF-870301—10
DE87004077	CONF-8610135—43
DE87004085	HEDL-SA—3319-FP
DE87004087	HEDL-SA—3363-FP
DE87004091	HEDL-SA—3280-FP
DE87004113	UCRL—94386
DE87004129	PNL-SA—14017
DE87004140	DOE/DP/50053—T1
DE87004165	GEPP-TIS—366d
DE87004187	DP-MS—86-167
DE87004246	BNL—39054
DE87004257	CONF-870134—1
DE87004279	CONF-8611117—3
DE87004295	DOE/ER/45258—1
DE87004300	DOE/ER/45255—1
DE87004324	DOE/CH/10276—1
DE87004325	DOE/CH/10282—1
DE87004346	HEDL-SA—3475-FP
DE87004348	HEDL-SA—3484-FP
DE87004353	UCRL—95155-Rev.1
DE87004355	UCRL—95082
DE87004360	UCRL—95853
DE87004385	DOE/ER/60435—T2
DE87004407	DOE/ER/10514—T3
DE87004416	DOE/ER/10005—T1
DE87004418	DOE/ER/40257—001
DE87004421	CONF-870144—1
DE87004432	HEDL-SA—3589-FP
DE87004465	PNL-SA—14209
DE87004475	LBL—22560
DE87004476	LBL—22445
DE87004477	LBL—22559
DE87004487	CONF-860931—7
DE87004500	LA-UR—87-78
DE87004507	DOE/PC/90957—T1
DE87004514	DP-MS—86-137
DE87004515	DP—1728
DE87004516	DPST—85-547
DE87004517	SAND—86-2553C
DE87004521	SAND—86-1382C
DE87004530	EGG-PHY—7223
DE87004534	EGG-M—27686
DE87004535	EGG-M—25986
DE87004536	EGG-M—36186
DE87004540	EGG-NERD—7444
DE87004541	EGG-M—32686
DE87004559	SLAC-PUB—4144
DE87004588	DOE/PC/80505—T5
DE87004590	DOE/OR/00033—T251
DE87004600	LBL—22418
DE87004605	BNL-NCS—38907
DE87004606	BNL—39096
DE87004612	BNL—39062
DE87004617	CONF-861096—3
DE87004620	CONF-870306—5
DE87004621	CONF-861207—46
DE87004644	DOE/DP/48013—T1
DE87004645	DOE/CH/10272—1
DE87004646	DOE/ER/13007—1
DE87004652	CONF-860953—7
DE87004653	CONF-860953—5
DE87004654	CONF-860961—7
DE87004659	CONF-860961—6
DE87004660	CONF-8609228—1
DE87004661	CONF-860961—5
DE87004662	CONF-860961—8
DE87004664	CONF-860953—10
DE87004667	CONF-860911—27
DE87004674	CONF-8609154—3
DE87004676	CONF-860914—31
DE87004677	CONF-860953—6
DE87004682	CONF-8609243—1
DE87004683	CONF-861114—39
DE87004684	CONF-861207—43
DE87004685	CONF-861185—3
DE87004686	CONF-861114—40
DE87004688	CONF-861193—2
DE87004689	CONF-861123—5
DE87004694	CONF-861123—7
DE87004695	CONF-8611103—6
DE87004698	CONF-861111—21
DE87004701	CONF-8611120—1
DE87004704	CONF-861207—62
DE87004706	CONF-861204—5
DE87004711	CONF-861123—6
DE87004712	CONF-860906—23
DE87004714	CONF-860908—38
DE87004715	CONF-860939—2
DE87004720	CONF-860968—4
DE87004721	CONF-861207—48
DE87004722	CONF-861207—50
DE87004723	CONF-861207—51
DE87004724	CONF-861111—19
DE87004732	CONF-860845—4
DE87004734	ANL-HEP-CP—86-126
DE87004744	CONF-861111—18
DE87004746	CONF-861146—14
DE87004748	CONF-861193—4
DE87004751	CONF-861185—7
DE87004752	CONF-861185—6
DE87004754	CONF-861114—53
DE87004756	CONF-860931—16
DE87004759	CONF-860931—15
DE87004764	LA—10859-MS

File No.	Report No.
DE87004767	LA—10811-MS
DE87004769	LA—10815-MS
DE87004770	LA—10700-MS
DE87004786	DOE/JPL/957031—86-Final
DE87004787	DOE/ID/12543—2
DE87004812	DOE/EIA—0226(86/10)
DE87004814	DOE/EIA—0206(85)
DE87004817	CONF-8610218—1
DE87004823	CONF-861008—2
DE87004825	CONF-861251—2
DE87004826	CONF-861211—22
DE87004830	CONF-861185—2
DE87004833	CONF-861204—4
DE87004835	CONF-861207—49
DE87004841	ANL-HEP-CP—86-130
DE87004842	ANL-HEP-CP—86-133
DE87004845	CONF-860953—8
DE87004846	CONF-8609234—1
DE87004849	DOE/ER/40159—113
DE87004850	DOE/ER/13326—T2
DE87004852	DOE/ET/53088—267
DE87004859	CONF-8610156—2
DE87004862	CONF-861008—3
DE87004863	CONF-861008—4
DE87004865	CONF-861068—15
DE87004866	CONF-861207—52
DE87004870	CONF-8609230—1
DE87004872	CONF-861207—47
DE87004874	ORAU/IEA—86-2(M)
DE87004878	DOE/OR/00033—T254
DE87004879	DOE/OR/00033—T252
DE87004880	DOE/OR/00033—T253
DE87004884	EGG—2491
DE87004885	DOE/OR/00033—T259
DE87004886	DOE/OR/00033—T268
DE87004888	DOE/OR/00033—T269
DE87004891	DOE/OR/00033—T263
DE87004896	CONF-840851—5
DE87004898	SLAC-PUB—4179
DE87004902	DOE/PC/80023—T7
DE87004906	DOE/CE/63487—T2
DE87004910	DOE/CE/10156—1
DE87004911	DOE/PC/80533—T5
DE87004912	DOE/PC/60039—11
DE87004914	DOE/ER/72012—T4
DE87004915	DOE/PC/90529—1
DE87004918	PNL-SA—13772
DE87004919	PNL-SA—14033
DE87004923	PNL-SA—14054
DE87004928	CONF-8610122—12
DE87004929	CONF-861008—5
DE87004930	CONF-8610122—13
DE87004933	CONF-8610196—5
DE87004934	CONF-8610135—55
DE87004935	CONF-8610159—2
DE87004937	CONF-8610135—54
DE87004939	CONF-8610135—59
DE87004943	CONF-8609239—2
DE87004945	ANL-HEP-CP—86-105
DE87004950	CONF-860911—26
DE87004956	CONF-861007—23
DE87004958	CONF-8610135—51
DE87004959	CONF-8610239—1
DE87004962	CONF-8610164—2
DE87004965	CONF-861102—33
DE87004967	ANL-HEP-CP—86-134
DE87004972	ANL-HEP-CP—86-122
DE87004974	CONF-860908—40
DE87004978	CONF-860931—10
DE87004979	CONF-860906—19
DE87004980	CONF-860931—9
DE87004981	CONF-860908—39
DE87004983	CONF-8609159—6
DE87004985	CONF-8610135—56
DE87004987	CONF-860763—5
DE87004988	CONF-8608108—5
DE87004989	CONF-860789—4
DE87004991	CONF-860789—3
DE87004994	CONF-860906—22
DE87004995	CONF-860906—21
DE87004997	CONF-860931—13
DE87004998	CONF-860931—12
DE87005005	DOE/ET/15601—8
DE87005018	DOE/PC/90751—T1
DE87005021	DOE/MC/12841—2254
DE87005025	DOE/PC/80529—T4
DE87005026	DOE/ER/25009—388
DE87005028	CONF-861068—16
DE87005030	DOE/ER/25009—378
DE87005033	DOE/ER/25009—371
DE87005035	DOE/ER/25009—290B
DE87005037	DOE/PC/80016—T2
DE87005039	DOE/PC/80524—T6
DE87005044	RFP—4060
DE87005053	UCRL—95946
DE87005059	SAND—86-2414C
DE87005060	SAND—86-2121C
DE87005064	SAND—87-7001C
DE87005066	SAND—86-2909C
DE87005068	SAND—87-0073C
DE87005092	DOE/ER/10420—8
DE87005113	LA-UR—87-83
DE87005123	LA-UR—87-38
DE87005124	LA-UR—87-22
DE87005125	LA-UR—87-16
DE87005126	LA-UR—87-15
DE87005130	LA-UR—86-3863
DE87005131	LA-UR—86-3861
DE87005132	LA-UR—86-3643
DE87005133	LA-UR—86-2243
DE87005161	ORNL/Sub—81-69611/02
DE87005171	DOE/ER/10690—7
DE87005178	SAND—85-7018/1
DE87005181	DOE/PC/80526—T6
DE87005183	DOE/ER/03231—10
DE87005194	BMI/ONWI—629
DE87005195	GEND—058
DE87005196	UCRL—52000-86-11
DE87005197	UCRL—53774
DE87005198	UCID—20664-86
DE87005200	UCID—20946
DE87005208	ANL/EES-TM—318-Vol.2
DE87005212	SAND—86-7161
DE87005214	SAND—86-7172
DE87005217	CONF-8609236—1
DE87005223	ORNL—6338
DE87005231	ORNL/M—295
DE87005232	ORNL/M—294
DE87005238	PNL—6141
DE87005243	BNL—39109
DE87005244	BNL—39105
DE87005246	BNL—38267
DE87005248	BNL—39052
DE87005250	BNL—38963
DE87005251	BNL—38938
DE87005252	BNL—39104
DE87005254	BNL—39169
DE87005255	BNL—39110
DE87005256	BNL—39057
DE87005257	BNL—39168
DE87005261	BNL—38969
DE87005268	UCID—17530-87-Rev.6
DE87005269	ORNL/TM—10256
DE87005270	ORNL/TM—9475
DE87005271	ORNL/TM—10226
DE87005272	ORNL/TM—10267
DE87005276	ORNL/TM—10198
DE87005278	ORNL/FEDC—85/10
DE87005282	ORNL/PPA—87/1
DE87005283	ORNL/ESH—1/V24
DE87005285	ORNL/TM—10038
DE87005286	ORNL/CSD/TM—240
DE87005288	ORNL/TM—10294
DE87005291	ORNL/TM—10264/V1
DE87005292	ORNL—6359
DE87005294	ORNL/TM—10324
DE87005302	DOE/ER/40226—2
DE87005303	DOE/ER/60348—5
DE87005310	DOE/MC/22044—3
DE87005330	CONF-870306—6
DE87005332	DOE/OR/21400—T283
DE87005338	CONF-870306—7
DE87005340	CONF-861207—58
DE87005341	CONF-870306—8
DE87005347	DOE/BC/10828—2
DE87005349	DOE/ID/12514—T1
DE87005355	DOE/ER/45056—5
DE87005358	DOE/ER/45056—4
DE87005359	DOE/ER/45056—3
DE87005360	DOE/ER/45116—16
DE87005361	DOE/ER/45116—17
DE87005362	DOE/ER/45116—18
DE87005363	CONF-8611117—2
DE87005382	DOE/PC/72008—T8
DE87005384	CONF-870306—11
DE87005389	BNL—39089
DE87005390	BNL—39088
DE87005391	BNL—39087
DE87005394	DOE/PC/63032—T16
DE87005419	DOE/JPL—1012-113
DE87005420	DOE/JPL—1012-115
DE87005424	DOE/JPL—1012-120
DE87005425	DOE/JPL—1012-121
DE87005427	DOE/JPL—1012-123
DE87005431	DOE/JPL/1060—96
DE87005443	EPRI-NP—4924-Vol.2
DE87005456	HEDL-SA—3336-FP
DE87005480	HEDL-SA—3534-FP
DE87005487	BMI/ONWI—631
DE87005493	HEDL—7627
DE87005494	HEDL—7612
DE87005498	CONF-8605150—3
DE87005502	DOE/EIS—126-F-Vol.1
DE87005509	CONF-870355—3
DE87005520	DOE/ER/40154—3
DE87005551	DOE/ER/40124—12
DE87005555	DOE/EIS—126-F-Vol.2
DE87005559	FNAL-TM—1428
DE87005561	FNAL-TM—1434
DE87005562	FNAL-TM—1436
DE87005563	FNAL-TM—1437
DE87005564	PNL—6087
DE87005568	DP—1709
DE87005569	DP—1718
DE87005573	DOE/FE—0079
DE87005575	DP—1673
DE87005576	BMI/ONWI—617
DE87005578	SERI/SP—232-3079
DE87005579	UCRL—53757
DE87005580	BMI/ONWI—630
DE87005582	SAND—86-8187
DE87005585	BNL—52049
DE87005587	ANL—86-51
DE87005588	UCRL—53726
DE87005589	UCRL—53753
DE87005590	DOE/WIPP—86-006
DE87005591	DOE/MA—0269
DE87005593	DOE/FE—0081
DE87005596	SLAC-PUB—4203
DE87005597	DOE/OR/21400—T286
DE87005608	DOE/PC/80536—T5
DE87005619	SAND—86-7051
DE87005621	WAPD-TM—1548
DE87005623	SAND—86-1865
DE87005624	SAND—86-2759
DE87005625	WAPD-TM—1616
DE87005645	ANL/EES-TM—319
DE87005658	DOE/ER/45091—3
DE87005686	CONF-870253—1
DE87005727	ORNL/Sub—85-28611/1
DE87005803	DOE/FE—0078
DE87005885	DOE/FE/60181—2271
DE87005924	UCRL—53273-Rev.1
DE87700666	BARC—1297
DE87700667	CERN—86-06
DE87700668	CERN—86-07
DE87700669	EFI—735(50)-84
DE87700670	EFI—774(1)-85
DE87700671	EFI—775(2)-85
DE87700672	EFI—776(3)-85
DE87700673	EFI—777(4)-85
DE87700674	EFI—779(6)-85
DE87700675	EFI—780(7)-85
DE87700676	EFI—781(8)-85
DE87700677	EFI—782(9)-85
DE87700678	EFI—784(11)-85
DE87700679	EFI—787(14)-85
DE87700680	EFI—788(15)-85
DE87700681	EFI—789(16)-85
DE87700682	EFI—790(17)-85
DE87700683	EFI—792(19)-85
DE87700684	EFI—793(20)-85
DE87700685	EFI—794(21)-85
DE87700686	EFI—796(23)-85
DE87700687	EFI—800(27)-85

File No.	Report No.
DE87700688	EFI—803(30)-85
DE87700689	EFI—811(38)-85
DE87700690	EFI—813(40)-85
DE87700691	EFI—819(46)-85
DE87700692	EIR—601
DE87700693	FEI—1551
DE87700694	FEI—1554
DE87700695	FEI—1630
DE87700696	FEI—1632
DE87700697	FEI—1657
DE87700698	FEI—1663
DE87700699	FEI—1722
DE87700700	HSK-AN—1816
DE87700701	IAE—4027/10
DE87700702	IAE—4067/4
DE87700703	IAE—4072/3
DE87700704	IAE—4110/2
DE87700705	IAE—4118/3
DE87700706	IAE—4132/2
DE87700707	IAEA-TECDOC—378
DE87700708	IAEA-TECDOC—384
DE87700709	IAEA-TECDOC—388
DE87700710	IFVE-OEF—85-32
DE87700711	IFVE-OEF—85-40
DE87700712	IFVE-OEF—85-174
DE87700713	IFVE-OEF-ORI—85-36
DE87700714	IFVE-OEIPK—85-108
DE87700715	IFVE-OI—85-134
DE87700716	IFVE-OI—85-185
DE87700717	IFVE-OKU—85-23
DE87700718	IFVE-ONF—85-73
DE87700719	IFVE-ONF—85-107
DE87700720	IFVE-OP—85-132
DE87700721	IFVE-OP—85-149
DE87700722	IFVE-ORI—85-148
DE87700723	IFVE-OTF—85-9
DE87700724	IFVE-OTF—85-30
DE87700725	IFVE-OTF—85-56
DE87700726	IFVE-OTF—85-70
DE87700727	IFVE-OTF—85-71
DE87700728	IFVE-OTF—85-112
DE87700729	IFVE-OTF—85-117
DE87700730	IFVE-OTF—85-167
DE87700731	IG—86/01
DE87700732	INIS-mf—10552
DE87700733	INIS-mf—10553(Vol.1)
DE87700734	INIS-mf—10553(Vol.2)
DE87700735	INIS-mf—10554
DE87700736	INIS-mf—10555
DE87700737	INIS-mf—10556-Vol.1
DE87700738	INIS-mf—10556-Vol.2
DE87700739	INIS-mf—10558
DE87700740	INIS-mf—10559
DE87700741	INIS-mf—10560
DE87700742	ITEF—25(1985)
DE87700743	ITEF—76(1985)
DE87700744	ITEF—101(1985)
DE87700745	ITEF—102(1985)
DE87700746	ITEF—120(1985)
DE87700747	ITEF—130(1985)
DE87700748	ITEF—145(1985)
DE87700749	ITEF—186(1984)
DE87700750	ITEF—191(1984)
DE87700751	ITEP—45(1985)
DE87700752	ITEP—118(1985)
DE87700753	ITEP—149(1985)
DE87700754	ITEP—153(1985)
DE87700755	ITEP—154(1985)
DE87700756	ITEP—156(1985)
DE87700757	ITF—85-134-R
DE87700758	ITF—86-4-R
DE87700759	ITF—86-18-R
DE87700760	ITF—86-29-R
DE87700761	ITF—86-31-R
DE87700762	ITP—85-117-E
DE87700763	ITP—86-20-E
DE87700764	ITP—86-25-E
DE87700765	JINR—6-84-819
DE87700766	JINR—9-85-769
DE87700767	JINR—13-85-734
DE87700768	JINR—13-85-754
DE87700769	JINR—13-85-795
DE87700770	JINR—13-85-810
DE87700771	JINR—13-85-817
DE87700772	JINR—13-85-839
DE87700773	JINR—13-85-840
DE87700774	JINR—13-86-13
DE87700775	JINR—E-1-85-861
DE87700776	JINR—E-2-85-737
DE87700777	JINR—E-2-85-748
DE87700778	JINR—E-2-85-779
DE87700779	JINR—E-2-85-794
DE87700780	JINR—E-2-85-808
DE87700781	JINR—E-2-85-865
DE87700782	JINR—E-2-85-930
DE87700783	JINR—E-4-85-527
DE87700784	JINR—E-4-86-40
DE87700785	JINR—E-5-85-867
DE87700786	JINR—E-16-85-814
DE87700787	JINR—E-19-85-202
DE87700788	JINR-R—1-85-220
DE87700789	JINR-R—1-85-228
DE87700790	JINR-R—1-85-820
DE87700791	JINR-R—1-85-854
DE87700792	JINR-R—1-85-948
DE87700793	JINR-R—2-85-152
DE87700794	JINR-R—2-85-420
DE87700795	JINR-R—2-85-520
DE87700796	JINR-R—2-85-712
DE87700797	JINR-R—2-85-723
DE87700798	JINR-R—2-85-767
DE87700799	JINR-R—2-85-830
DE87700800	JINR-R—2-85-831
DE87700801	JINR-R—2-85-942
DE87700802	JINR-R—4-85-816
DE87700803	JINR-R—4-85-876
DE87700804	JINR-R—4-86-115
DE87700805	JINR-R—6-85-753
DE87700806	JINR-R—9-85-271
DE87700807	JINR-R—10-85-744
DE87700808	JINR-R—10-85-781
DE87700809	JINR-R—10-85-783
DE87700810	JINR-R—11-85-757
DE87700811	JINR-R—11-85-764
DE87700812	JINR-R—11-85-765
DE87700813	JINR-R—11-85-766
DE87700814	JINR-R—13-85-752
DE87700815	JINR-R—15-85-786
DE87700816	JINR-R—16-85-802
DE87700817	KFKI—1986-23/C
DE87700818	KFKI—1986-32/B
DE87700819	KFKI—1986-37/A
DE87700820	KFKI—1986-40/G
DE87700821	KFKI—1986-41/C
DE87700822	KFKI—1986-47/A
DE87700823	KFKI—1986-48/A
DE87700825	KFKI—1986-51/B
DE87700826	KFTI—85-6
DE87700827	KIYI—85-6
DE87700828	KIYI—85-13
DE87700829	KIYI—85-17
DE87700830	KIYI—85-19
DE87700831	KIYI—85-21
DE87700832	KIYI—85-22
DE87700833	KIYI—85-23
DE87700834	KIYI—85-25
DE87700835	KIYI—85-27
DE87700836	KIYI—85-28
DE87700837	KIYI—85-31
DE87700838	KIYI—85-32
DE87700839	KIYI—85-35
DE87700840	KIYI—85-36
DE87700841	KIYI—86-34
DE87700842	NIIEFA-P-D—0637
DE87700843	NIIEFA-P-E—0665
DE87700844	NIIEFA-P-E—0671
DE87700845	NIIEFA-P-K—0681
DE87700846	NIIEFA-P-K—0687
DE87700847	NIIEFA-P-V—0684
DE87700848	OEFZS—4376
DE87700889	IAEA-TECDOC—376
DE87700915	INDC(NDS)—182/GE
DE87701064	JAERI-M—86-067
DE87701145	JINR—R-2-86-147
DE87701166	JINR—R-7-86-6
DE87701222	KURRI-TR—266
DE87701240	UTNL-R—0176
DE87701241	UTRCN-S—8
DE87701244	BARC—1244
DE87701245	BARC—1245
DE87701246	BARC—1246
DE87701247	BARC—1250
DE87701248	BARC—1252
DE87701249	BARC—1253
DE87701250	BARC—1255
DE87701251	BARC—1256
DE87701252	BARC—1259
DE87701253	BARC—1260
DE87701254	BARC—1281
DE87701255	BARC—1288
DE87701256	BARC—1289
DE87701257	BARC—1291
DE87701258	BARC—1293
DE87701259	BARC—1294
DE87701260	BARC—1295
DE87701261	BARC—1298
DE87701262	BARC—1299
DE87701263	BARC—1300
DE87701264	BARC—1301
DE87701265	BARC—1302
DE87701266	BARC—1303
DE87701267	BARC—1304
DE87701268	BARC—1305
DE87701269	BARC—1306
DE87701270	BARC—1307
DE87701271	BARC—1310
DE87701272	CNIC—00002
DE87701273	CNIC—00003
DE87701274	CNIC—00004
DE87701275	CNIC—00005
DE87701276	CNIC—00006
DE87701277	CNIC—00007
DE87701278	CNIC—00008
DE87701279	CNIC—00009
DE87701280	CNIC—00010
DE87701282	FEI—1548
DE87701283	IAE—3999/4
DE87701284	IAEA-R—3178-F
DE87701286	IAEA-TECDOC—383
DE87701287	IAEA-TECDOC—385
DE87701288	IFVE-OEF—85-153
DE87701289	IFVE-ONF-OEF—85-157
DE87701290	INDC(AUS)—011/LI
DE87701295	INIS-mf—10524
DE87701296	INIS-mf—10528
DE87701297	INIS-XN—23
DE87701298	INIS-XN—24
DE87701299	INIS-XN—37
DE87701300	INIS-XN—38
DE87701301	INIS-XN—39
DE87701302	INIS-XN—40
DE87701303	INIS-XN—41
DE87701304	INIS-XN—42
DE87701305	INIS-XN—43
DE87701306	INIS-XN—44
DE87701307	INIS-XN—45
DE87701308	INIS-XN—46
DE87701309	INIS-XN—47
DE87701310	INIS-XN—48
DE87701311	INIS-XN—49
DE87701312	INIS-XN—50
DE87701313	INS—543
DE87701314	INS—550
DE87701315	INS—553
DE87701316	INS-TEC—22
DE87701317	INS-TH—161
DE87701318	ITEF—81(1985)
DE87701319	ITEF—109(1985)
DE87701320	ITEF—121(1985)
DE87701321	ITEF—182(1984)
DE87701322	ITEP—115(1985)
DE87701323	ITEP—187(1984)
DE87701324	ITF—85-80-R
DE87701325	ITF—85-118-R
DE87701326	ITP—85-73-E
DE87701327	JINR—13-85-306
DE87701328	JINR—D-13-85-653
DE87701329	JINR—E-4-85-706
DE87701330	JINR—E-4-85-728
DE87701331	JINR—E-7-85-431
DE87701332	JINR—E-14-85-284
DE87701333	JINR—R-2-85-343
DE87701334	JINR—R-2-85-729
DE87701335	JINR—R-4-85-239
DE87701336	JINR—R-7-85-261

File No.	Report No.
DE87701337	JINR—R-10-85-333
DE87701338	JINR—R-11-85-344
DE87701339	JINR—R-13-85-256
DE87701340	JINR—R-13-85-819
DE87701341	NIIAR—19(665)
DE87750439	CEA-CONF—8318
DE87750440	CEA-CONF—8406
DE87750441	CEA-CONF—8343
DE87750442	CEA-CONF—8348
DE87750443	ISN—84-47
DE87750444	CEA-CONF—8454
DE87750445	CEA-CONF—8461
DE87750446	CEA-CONF—8460
DE87750448	CEA-CONF—8440
DE87750449	CEA-CONF—8468
DE87750450	LAL-RT—85-16
DE87750451	CENBG—8528
DE87750452	CENBG—8602
DE87750453	CRN-CPR—84-1
DE87750454	CRN-PN—84-44
DE87750455	CEA-CONF—8520
DE87750456	CEA-CONF—8530
DE87750457	CEA-CONF—8492
DE87750458	CEA-CONF—8497
DE87750459	CEA-CONF—8498
DE87750460	CEA-CONF—8531
DE87750461	CEA-CONF—8557
DE87750463	CEA-CONF—8542
DE87750464	CEA-CONF—8537
DE87750465	CEA-CONF—8538
DE87750466	CEA-CONF—8529
DE87750467	CEA-CONF—8540
DE87750468	CEA-CONF—8547
DE87750469	CEA-CONF—8546
DE87750470	CEA-CONF—8524
DE87750471	CEA-CONF—8370
DE87750472	CEA-CONF—8519
DE87750473	CEA-CONF—8562
DE87750474	CEA-CONF—8563
DE87750475	CEA-CONF—8439
DE87750476	CENBG-R—8601
DE87750498	INIS-mf—10312
DE87750499	INIS-mf—10313
DE87750500	GSI—86-32-Prepr.
DE87750501	GSI—86-31-Prepr.
DE87750502	IPP—2/280
DE87750503	KFK—4120
DE87750504	IPP—III/112
DE87750505	KFK—4094
DE87750506	IPP—9/47
DE87750507	KFK—4113
DE87750508	KFK—4123
DE87750509	GSF—16/86
DE87750510	KFK—4126
DE87750511	KFK—4124
DE87750512	INIS-mf—10317
DE87750513	GSI—86-16
DE87750515	INIS-mf—10318
DE87750516	INIS-mf—10252
DE87750517	KFK—4134
DE87750519	PTB-Dos—14
DE87750520	HMI-B—429
DE87750521	KFK—4099
DE87750522	RCM—02286
DE87750523	INIS-mf—10282
DE87750525	KFK—4019
DE87750526	NORDITA—84/43-Prepr.
DE87750527	NORDITA—84/44-Prepr.
DE87750528	NORDITA—85/12-Prepr.
DE87750529	NORDITA—85/19-Prepr.
DE87750530	NORDITA—85/16-Prepr.
DE87750531	NORDITA—85/15-Prepr.
DE87750532	NORDITA—85/18-Prepr.
DE87750533	NBI-HE—84-39
DE87750534	NBI-HE—84-42
DE87750537	CEA-N—2479
DE87750538	CEA-R—5359
DE87750539	EDF-DER-RA—1985-1
DE87750540	EUR—10126
DE87750541	EUR—10503
DE87750542	EUR—10026
DE87750543	EUR—10043
DE87750544	EUR—10441
DE87750545	EUR—10382
DE87750546	EUR—10411
DE87750547	EUR—10125
DE87750548	EUR—10124
DE87750549	EUR—10189
DE87750550	EUR—9772
DE87750551	EUR—10445
DE87750552	EUR—10107
DE87750553	EUR—10293
DE87750554	CEA-DAS—219
DE87750555	EUR—10491
DE87750556	CEA-CONF—8487
DE87750557	CEA-CONF—8553
DE87750558	CEA-CONF—8506
DE87750559	CEA-CONF—8400
DE87750560	CEA-CONF—8421
DE87750563	CEA-CONF—8512
DE87750564	CEA-CONF—8514
DE87750565	CEA-CONF—8489
DE87750566	CEA-CONF—8496
DE87750567	CEA-CONF—8523
DE87750568	CEA-CONF—8517
DE87750569	CEA-CONF—8516
DE87750570	CEA-CONF—8511
DE87750571	CEA-CONF—8564
DE87750572	CEA-CONF—8483
DE87750573	CEA-CONF—8494
DE87750574	CEA-CONF—8466
DE87750575	CEA-CONF—8340
DE87750576	CEA-CONF—8555
DE87750577	CEA-CONF—8556
DE87750578	CEA-CONF—8513
DE87750579	IPNO-TH—86-09
DE87750580	LAPP-TH—152
DE87750581	LYCEN—8445
DE87750582	GANIL-P—86-12
DE87750583	GANIL-P—86-09
DE87750584	GANIL-P—86-02
DE87750585	LAPP-TH—147
DE87750586	EUR—10444
DE87750587	CEA-CONF—8558
DE87750589	CEA-CONF—8503
DE87750590	GANIL-P—86-08
DE87750732	IPNO-DRE—85-21
DE87750758	IPNO-DRE—85-16
DE87750857	RISO-M—2594
DE87750863	NP—7750863
DE87750864	KFK—3930-UF
DE87750865	NP—7750865
DE87750866	NP—7750866
DE87751262	NP—7751262
DE87751294	TNO-HMT-R—83/159A
DE87751297	Juel-Spez—352
DE87751298	BMFT-FB-T—86-083
DE87751299	NP—7751299
DE87751300	BMFT-FB-T—86-109
DE87751301	VW-FMT—8409V/5
DE87751302	NP—7751302
DE87751303	KFK—4137
DE87751304	NP—7751304
DE87751305	CONF-8503273—Summ.
DE87751306	CONF-8412124—Exc.
DE87751308	Juel-Conf—55
DE87751309	Juel-Conf—58
DE87751310	BMFT-FB-T—86-087
DE87770046	NP—7770046
DE87770047	NP—7770047
DE87770048	NP—7770048
DE87770049	NP—7770049
DE87770050	NP—7770050
DE87770051	NP—7770051
DE87770052	NP—7770052
DE87770053	NP—7770053
DE87770054	NP—7770054
DE87770059	NP—7770059
DE87770060	NP—7770060
DE87770061	NP—7770061
DE87770062	NP—7770062
DE87770063	NP—7770063
DE87780078	INIS-SU—370
DE87900303	TRI-PP—86-86
DE87900322	TRI-PP—86-100
DE87900324	TRI-PP—86-104
DE87900430	LRP—306/86
DE87900493	CONF-8611109—9
DE87900497	CONF-8611109—5
DE87900498	CONF-8611109—3
DE87900499	IAEA-TC—579-24
DE87900500	IAEA-TC—579-31
DE87900501	CONF-8611109—7
DE87900503	IAEA-TC—579/42
DE87900509	BG-Trans—15029
DE87900515	NMRDI—2-74-4122
TI87000271	TPR-NS—28-No.1
TI87003342	CONF-8310105—2
TI87004171	BNL-NUREG—39007
TI87004603	BNL-NUREG—39048
TI87004848	NUREG/CR—4737
TI87005236	NUREG/CR—4320
TI87005242	BNL-NUREG—39156
TI87005245	BNL-NUREG—39157
TI87005635	NUREG/CR—4300-Vol.3-No.2
TI87005636	NUREG/CR—4730
TI87900436	CONF-860709—3
TI87900441	CONF-8604218—7
TI87900455	CONF-8611125—1
TI87900472	ATR—86(8443)-1
TI87900473	ND-R—1224(R)
TI87900474	NUREG—1240
TI87900476	MMS—86-0127-Vol.1
TI87900481	NP—7900481
TI87900482	NUREG—1237
TI87900484	NUREG—1137-Suppl.5
TI87900486	NP—7900486
TI87900510	NUREG—1199
TI87900511	NUREG—1200
TI87900512	NUREG/CR—4788
TI87920211	EPRI-EM—4988-Vol.1
TI87920215	EPRI-NP—4222-Vol.3
TI87920217	EPRI-NP—4222-Vol.5
TI87920218	EPRI-NP—4817
TI87920221	EPRI-NP—4991
TI87920222	EPRI-NP—4999
TI87920224	EPRI-NP—5001
TI87920225	EPRI-NP—5008
TI87920228	EPRI-NP—4574-CCM-Pt.2-Ch.7-Vol.1
TI87920233	EPRI-CS—5013
TI87920237	EPRI-EL—5003-Vol.1
TI87920241	EPRI-EM—4882-CCM
TI87920244	EPRI-NP—5015
TI87920247	EPRI-NP—4574-CCM-Pt.2-Ch.2-Vol.2
TI87920248	EPRI-NP—4574-CCM-Pt.2-Ch.12-Vol.3
TI87920251	EPRI-AP—5029
TI87920254	EPRI-EL—4610
TI87920255	EPRI-EL—2000-CCM
TI87920256	EPRI-EL—2004-CCM
TI87920257	EPRI-EL—2001-CCM
TI87920258	EPRI-EL—2003-CCM
TI87920263	EPRI-EL—2002-CCM

AVAILABILITY OF REFERENCES ABSTRACTED

REPORTS

A document cited in this publication is considered a "report" when it carries a unique identifying number (e.g., ANL-3130, BNL-4000, DP-150, etc.) as the first element of the citation. Usually, one or more of the following abbreviations will appear at or near the end of the citation, indicating the organization from which the document is available. If none of these abbreviations appears, the report should be requested from either the cited publisher or corporate source.

GPO Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

GPO Dep. Available for inspection or interlibrary loan at GPO depository libraries. Unlimited DOE reports are being sent to the GPO depository libraries. See inside back cover for list of the libraries. These reports are identified by report number, Supt. of Docs. Class Number (E 1.99:) and OSTI accession/file number, e.g., DE87003384.

NTIS For sale by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. Paper copy (PC) and other price codes are for domestic users; prices for foreign purchasers are, in most instances, twice the domestic price. There is only one microfiche (MF) price code, MF A01 ($6.50).

OSTI Available from the Office of Scientific and Technical Information (OSTI), U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831, Attn: Technical Information Division.

NOTE: DOE offices and contractors should order reports from OSTI; all others should order from NTIS. For additional information, see the introductory paragraph to the Report Number Index.

NTIS NORTH AMERICAN PRICE CODES

Most NTIS products and services are now announced by price codes and, therefore, without specific prices in NTIS journals, newsletters, and indexes.

The current dollar equivalent for each code is shown in the schedule below. Orders must list the accession number(s) and be accompanied by the total dollar amount from the current schedule.

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, United States, and Mexico, please use this price schedule; other addressees, write for PR-360-4.

MICROFICHE	EXCEPTIONAL	MAGNETIC TAPES	DISKETTES
A01 $6.50	E01 $7.50	T01 $150.00	D01 $ 50
	E02 10.50	T02 175.00	D02 75
PAPER COPY	E03 11.00	T03 300.00	D03 125
A02 $9.95	E04 13.50	T04 400.00	D04 175
A03 11.95	E05 15.50	T05 500.00	D05 225
A04 13.95	E06 18.00	T06 600.00	D06 275
A05 13.95	E07 20.50	T07 700.00	D07 325
A06 18.95	E08 23.00	T08 800.00	D08 375
A07 18.95	E09 25.50	T09 900.00	D09 425
A08 18.95	E10 28.00	T10 1,000.00	D10 475
A09 18.95	E11 30.50	T11 1,100.00	D11 525
A10 24.95	E12 33.00	T12 1,200.00	D12 575
A11 24.95	E13 35.50	T13 1,300.00	D13 625
A12 24.95	E14 38.50	T14 1,400.00	D14 675
A13 24.95	E15 42.00	T15 1,500.00	D15 725
A14 30.95	E16 46.00	T16 1,600.00	D16 775
A15 30.95	E17 50.00	T17 1,700.00	D18 875
A16 30.95	E18 54.00	T18 1,800.00	D19 925
A17 30.95	E19 60.00	T19 1,900.00	
A18 36.95	E20 70.00	T99 *	
A19 36.95	E99 *		
A20 36.95			
A21 36.95	N01 $45.00		
A22 42.95	N02 48.00		
A23 42.95			
A24 42.95			
A25 42.95			
A99 *			

*Contact NTIS for price quote.

PRICES EFFECTIVE JANUARY 1, 1987

U. S. DEPARTMENT OF COMMERCE

National Technical Information Service

5285 Port Royal Road, Springfield, Virginia 22161

NON-REPORT DOCUMENTS

BOOKS

Most books cited are available from commercial publishers. Order from the publisher or other source as given, not from OSTI.

CONFERENCE PAPERS

Individual conference papers (or preprints) not available as reports should be requested from the originator or other source as cited.

CONFERENCE PROCEEDINGS

Many proceedings are available from commercial publishers; in other cases, request from the society, organization, institution, etc., cited as the source.

DISSERTATIONS (THESES)

Available from University Microfilms International, Dissertation Copies, P. O. Box 1764, Ann Arbor, MI 48106. Request by order number cited, e.g., 87-22,350.

JOURNAL ARTICLES

Users must use their own resources to obtain (or scan) articles cited—local, state, or university libraries or publishers, reprint services, etc.

MONOGRAPHS

Request from the organization, institution, society, etc., responsible for the monograph.

PATENTS

Although not cataloged as reports, patents cited from each country are listed in the Report Number Index under PATENTS-AU, PATENTS-FR, PATENTS-US, etc. U. S. Patent Applications (e.g., A 293,415) are available from NTIS.

CODES USED ON INDEX LINES

Following the citation numbers in the Corporate Author, Personal Author, and Subject Indexes, codes are used to designate the type of document, country of publication, and language of the document, e.g., (R;SU;RU). The language designator does not appear if the document is published in English.

DOCUMENT TYPES

J	Journal article
TJ	Translation of a journal article
R	Report
RA	Report analytic
B	Book
BA	Book analytic
P	Patent
E	Engineering materials
D	Dissertation
TG	Translation (general)
TA	Translation (analytic)

COUNTRY CODES

AD	Andorra
AE	United Arab Emirates
AF	Afghanistan
AL	Albania
AR	Argentina
AT	Austria
AU	Australia
BB	Barbados
BD	Bangladesh
BE	Belgium
BG	Bulgaria
BH	Bahrain
BI	Burundi
BJ	Benin
BM	Bermuda
BO	Bolivia
BR	Brazil
BS	Bahamas
BT	Bhutan
BU	Burma
BW	Botswana
BY	Byelorussian Soviet Socialist Republic (Byelorussian SSR)
CA	Canada
CB	Khmer Republic
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Ivory Coast
CL	Chile
CM	United Republic of Cameroon
CN	China
CO	Colombia
CR	Costa Rica
CS	Czechoslovakia
CU	Cuba
CY	Cyprus
DD	German Democratic Republic
DE	Germany, Federal Republic of (F.R. Germany)
DK	Denmark
DO	Dominican Republic
DZ	Algeria
EC	Ecuador
EG	Egypt
ES	Spain
ET	Ethiopia
FI	Finland
FJ	Fiji
FR	France
GA	Gabon
GB	United Kingdom of Great Britain and Northern Ireland (UK)
GD	Grenada
GH	Ghana
GM	Gambia
GN	Guinea
GQ	Equatorial Guinea
GR	Greece
GT	Guatemala
GU	Guam
GW	Guinea-Bissau
GY	Guyana
HK	Hong Kong
HN	Honduras
HT	Haiti
HU	Hungary
HV	Upper Volta
ID	Indonesia
IE	Ireland
IL	Israel
IN	India
IQ	Iraq
IR	Iran
IS	Iceland
IT	Italy
JM	Jamaica
JO	Jordan
JP	Japan
KE	Kenya
KH	Democratic Kampuchea
KP	Democratic People's Republic of Korea
KR	Korea, Republic of
KW	Kuwait
LA	Laos
LB	Lebanon
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LU	Luxembourg
LY	Libyan Arab Republic
MA	Morocco
MC	Monaco
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MT	Malta

MU	Mauritius
MV	Maldives
MW	Malawi
MX	Mexico
MY	Malaysia
NE	Niger
NG	Nigeria
NI	Nicaragua
NL	Netherlands
NO	Norway
NP	Nepal
NR	Nauru
NZ	New Zealand
OM	Oman
PA	Panama
PE	Peru
PG	Papua New Guinea
PH	Philippines
PK	Pakistan
PL	Poland
PR	Puerto Rico
PT	Portugal
PY	Paraguay
QA	Qatar
RH	Southern Rhodesia
RO	Romania
RW	Rwanda
SA	Saudi Arabia
SD	Sudan
SE	Sweden
SG	Singapore
SK	Sikkim
SL	Sierra Leone
SM	San Marino
SN	Senegal
SO	Somalia
SU	Union of Soviet Socialist Republics (USSR)
SV	El Salvador
SY	Syria
SZ	Swaziland
TD	Chad
TG	Togo
TH	Thailand
TN	Tunisia
TO	Tonga
TR	Turkey
TT	Trinidad and Tobago
TW	Taiwan
TZ	United Republic of Tanzania
UA	Ukrainian Soviet Socialist Republic (Ukrainian SSR)
UG	Uganda
US	United States of America (USA)
UY	Uruguay
VA	Holy See
VE	Venezuela
VI	Virgin Islands of the United States
VN	Viet Nam
WS	Western Samoa
YD	Democratic Yemen
YE	Yemen
YU	Yugoslavia
ZA	South Africa
ZM	Zambia
ZR	Zaire
ZW	Zimbabwe

LANGUAGE CODES

BE	Belorussian
BU	Bulgarian
CH	Chinese
CZ	Czech
DA	Danish
DU	Dutch
FI	Finnish
FL	Flemish
FR	French
GE	German
HE	Hebrew
HI	Hindi
HU	Hungarian
IR	Iranian
IT	Italian
JA	Japanese
KO	Korean
NO	Norwegian
PO	Polish
PT	Portuguese
RN	Rumanian
RU	Russian
SC	Serbo-Croatian
SE	Slovene
SP	Spanish
SV	Slovak
SW	Swedish
TH	Thai
TU	Turkish
UK	Ukrainian
VT	Vietnamese

* U. S. GOVERNMENT PRINTING OFFICE: 1987-748-167:40025

CUT OUT APPROPRIATE FORM AND MAIL IN A STAMPED ENVELOPE TO THE ADDRESS INDICATED.

Change of Address Form

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

MAIL THIS FORM TO:

NEW ADDRESS
Superintendent of Documents
Government Printing Office SSOM
Washington, D.C. 20402

Attach last subscription label here.

Subscription Order Form

Enter my Subscription to: _____

(Please indicate publication)

@ $_____ Domestic; @ $_____ Foreign.

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

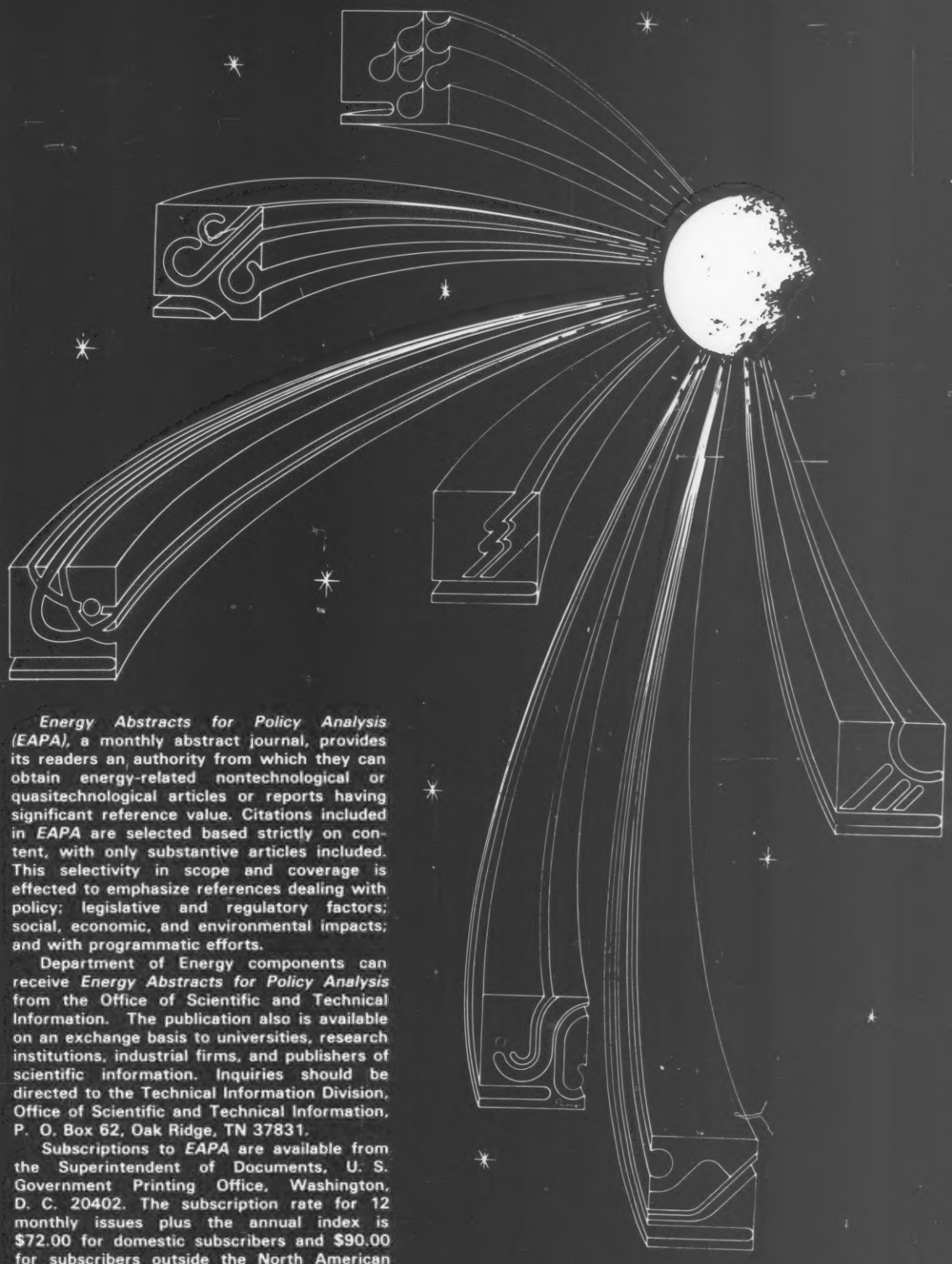
PLEASE PRINT OR TYPE

(or) COUNTRY

☐ Remittance Enclosed (Make checks payable to Superintendent of Documents)

☐ Charge to my Deposit Account No._____

MAIL ORDER FORM TO:
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402



Energy Abstracts for Policy Analysis (EAPA), a monthly abstract journal, provides its readers an authority from which they can obtain energy-related nontechnological or quasitechnological articles or reports having significant reference value. Citations included in *EAPA* are selected based strictly on content, with only substantive articles included. This selectivity in scope and coverage is effected to emphasize references dealing with policy; legislative and regulatory factors; social, economic, and environmental impacts; and with programmatic efforts.

Department of Energy components can receive *Energy Abstracts for Policy Analysis* from the Office of Scientific and Technical Information. The publication also is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Technical Information Division, Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

Subscriptions to *EAPA* are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for 12 monthly issues plus the annual index is $72.00 for domestic subscribers and $90.00 for subscribers outside the North American continent. The annual index is available separately to subscribers for $16.00 (domestic) or $20.00 (for those outside the North American continent). A single issue costs $5.00 (domestic) or $6.25 (outside the North American continent).

FEDERAL DEPOSITORY LIBRARY PROGRAM

As a result of an agreement between the U. S. Government Printing Office (GPO) and the Department of Energy, beginning in 1984 DOE reports with unlimited distribution are now included in the Federal Depository Library Program. The Regional Depository Libraries listed below receive and retain at least one copy of nearly every Federal Government publication, either in printed or microfilm form, for use by the general public. These libraries provide reference services and interlibrary loans; however, they are *not* sales outlets. You may wish to ask your local library to contact a Regional Depository to help you locate specific publications, or you may contact the Regional Depository yourself. Do not send checks or orders to these libraries.

ARKANSAS STATE LIBRARY
One Capitol Mall
Little Rock, AR 72201
(501) 371-2326

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Department
Montgomery, AL 36193
(205) 279-9110, ext. 253

UNIV. OF ALABAMA LIBRARY
Documents Dept.-Box S
University, AL 35486
(205) 348-7369

DEPT. OF LIBRARY, ARCHIVES AND PUBLIC RECORDS
Third Floor-State Cap.
1700 West Washington
Phoenix, AZ 85007
(602) 255-4121

UNIVERSITY OF ARIZONA LIB.
Governments Documents Dept.
Tucson, AZ 85721
(602) 626-5233

CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 2037
Sacramento, CA 95809
(916) 322-4572

UNIV. OF COLORADO LIB.
Government Pub. Division
Campus Box 184
Boulder, CO 80309
(303) 492-8834

DENVER PUBLIC LIBRARY
Govt. Pub. Department
1357 Broadway
Denver, CO 80203
(303) 571-2131

CONNECTICUT STATE LIBRARY
Government Documents Unit
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971

UNIV. OF FLORIDA LIBRARIES
Library West
Documents Department
Gainesville, FL 32611
(904) 392-0367

UNIV. OF GEORGIA LIBRARIES
Government Reference Dept.
Athens, GA 30602
(404) 542-8951

UNIV. OF HAWAII LIBRARY
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344

ILLINOIS STATE LIBRARY
Information Services Branch
Centennial Building
Springfield, IL 62706
(217) 782-5185

INDIANA STATE LIBRARY
Serials Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3686

UNIV. OF IOWA LIBRARIES
Govt. Documents Department
Iowa City, IA 52242
(319) 353-3318

UNIVERSITY OF KANSAS
Doc. Collect.-Spencer Lib.
Lawrence, KS 66045
(913) 864-4662

UNIV. OF KENTUCKY LIBRARIES
Govt. Pub. Department
Lexington, KY 40506
(606) 257-3139

LOUISIANA STATE UNIVERSITY
Middleton Library
Govt. Docs. Dept.
Baton Rouge, LA 70803
(504) 388-2570

LOUISIANA TECHNICAL UNIV. LIBRARY
Documents Department
Ruston, LA 71272
(318) 257-4962

UNIVERSITY OF MAINE
Raymond H. Fogler Library
Tri-State Regional Documents Depository
Orono, ME 04469
(207) 581-1680

UNIVERSITY OF MARYLAND
McKeldin Lib.-Doc. Div.
College Park, MD 20742
(301) 454-3034

BOSTON PUBLIC LIBRARY
Government Docs. Dept.
Boston, MA 02117
(617) 536-5400 ext. 226

DETROIT PUBLIC LIBRARY
Sociology Department
5201 Woodward Avenue
Detroit, MI 48202
(313) 833-1409

MICHIGAN STATE LIBRARY
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640

UNIVERSITY OF MINNESOTA
Government Pubs. Division
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 373-7813

UNIV. OF MISSISSIPPI LIB.
Documents Department
University, MS 38677
(601) 232-5857

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812
(406) 243-6700

NEBRASKA LIBRARY COMM.
Federal Documents
1420 P Street
Lincoln, NE 68508
(402) 471-2045
(in cooperation with University of Nebraska-Lincoln)

UNIVERSITY OF NEVADA LIB.
Govt. Pub. Department
Reno, NV 89557
(702) 784-6579

NEWARK PUBLIC LIBRARY
5 Washington Street
Newark, NJ 07101
(201) 733-7812

UNIVERSITY OF NEW MEXICO
Zimmerman Library
Government Pub. Dept.
Albuquerque, NM 87131
(505) 277-5441

NEW MEXICO STATE LIBRARY
Reference Department
325 Don Gaspar Avenue
Santa Fe, NM 87501
(505) 827-2033, ext. 22

NEW YORK STATE LIBRARY
Empire State Plaza
Albany, NY 12230
(518) 474-5563

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Wilson Library
BA/SS Documents Division
Chapel Hill, NC 27515
(919) 962-1321

UNIVERSITY OF NORTH DAKOTA
Chester Fritz Library
Documents Department
Grand Forks, ND 58202
(701) 777-2617, ext. 27
(in cooperation with North Dakota State Univ. Library)

STATE LIBRARY OF OHIO
Documents Department
65 South Front Street
Columbus, OH 43215
(614) 462-7051

OKLAHOMA DEPT. OF LIBRARIES
Government Documents
200 NE 18th Street
Oklahoma City, OK 73105
(405) 521-2502

OKLAHOMA STATE UNIV. LIB.
Documents Department
Stillwater, OK 74078
(405) 624-6546

PORTLAND STATE UNIV. LIB.
Documents Department
P.O. Box 1151
Portland, OR 97207
(503) 229-3673

STATE LIBRARY OF PENN.
Government Pub. Section
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

TEXAS STATE LIBRARY
Public Services Department
P.O. Box 12927-Cap. Sta.
Austin, TX 78753
(512) 471-2996

TEXAS TECH. UNIV. LIBRARY
Govt. Documents Department
Lubbock, TX 79409
(806) 742-2268

UTAH STATE UNIVERSITY
Merrill Library, U.M.C. 30
Logan, UT 84322
(801) 750-2682

UNIVERSITY OF VIRGINIA
Alderman Lib.-Public Doc.
Charlottesville, VA 22901
(804) 924-3133

WASHINGTON STATE LIBRARY
Documents Section
Olympia, WA 98504
(206) 753-4027

WEST VIRGINIA UNIV. LIB.
Documents Department
Morgantown, WV 26506
(304) 293-3640

MILWAUKEE PUBLIC LIBRARY
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-3000

ST. HIST. LIB. OF WISCONSIN
Government Pub. Section
816 State Street
Madison, WI 53706
(608) 262-4347

WYOMING STATE LIBRARY
Supreme Ct. & Library Bld.
Cheyenne, WY 82002
(307) 777-6344

SPECIAL FOURTH

United States Department of Energy
Office of Scientific and Technical Information
Post Office Box 62
Oak Ridge, Tennessee 37831

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

3227
UNIV MICROFILMS INTERNATIONAL
ATTN SERIALS PROCESSING
300 NORTH ZEEB RD
ANN ARBOR, MI 48106

FS- 1

POSTAGE AND FEES PAID
DEPARTMENT OF ENERGY
DOE-350

U.S.MAIL